ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

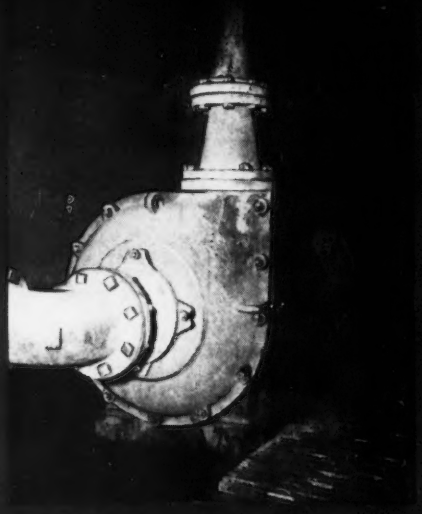
AUGUST 1954

PRICE FIFTY CENTS

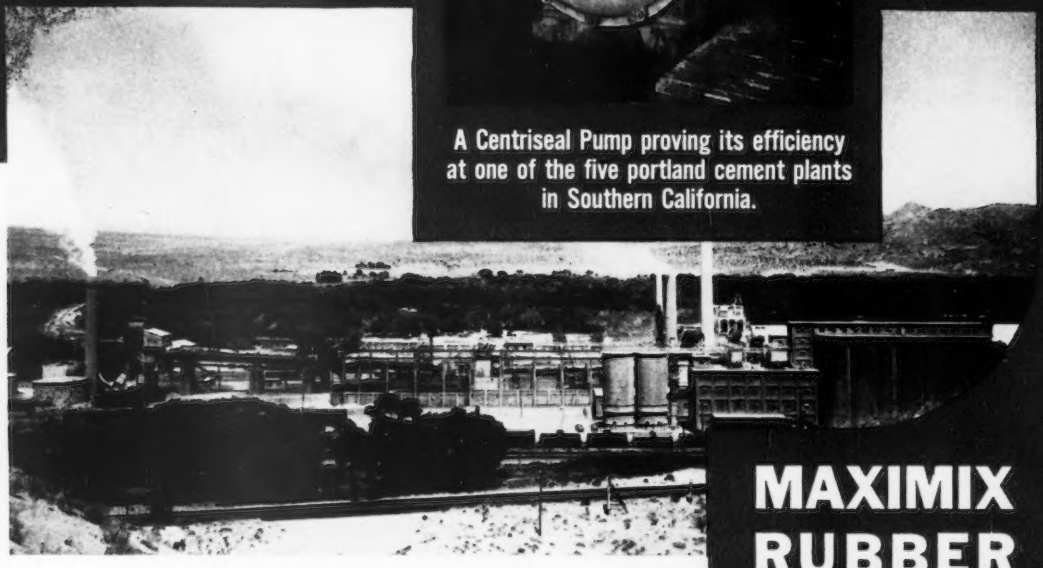
FOUNDED 1866

Anaconda's Weed Heights Project—A New Approach . . . p. 72

Better pumping



A Centriseal Pump proving its efficiency at one of the five portland cement plants in Southern California.

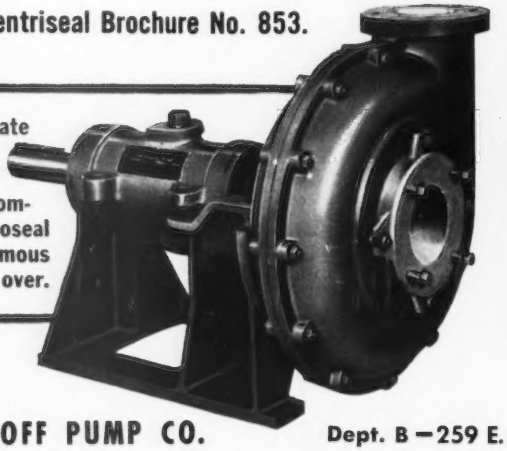


Within six months of being tried for the first time in cement manufacture, additional Centriseal Pumps have been ordered—on the basis of their outstanding performance!

Write for Centriseal Brochure No. 853.

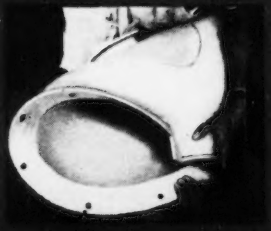
You are invited to
Booth 1015
AMC Mining Show
San Francisco
Sept. 20-23

Designed to operate entirely without seal-water, the Centriseals are complements to Hydroseal abrasives-moving pumps, famous in mining fields the world over.



MAXIMIX RUBBER parts mean:

LONGER LIFE



EASY REPLACEMENT

THE ALLEN-SHERMAN-HOFF PUMP CO. Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.

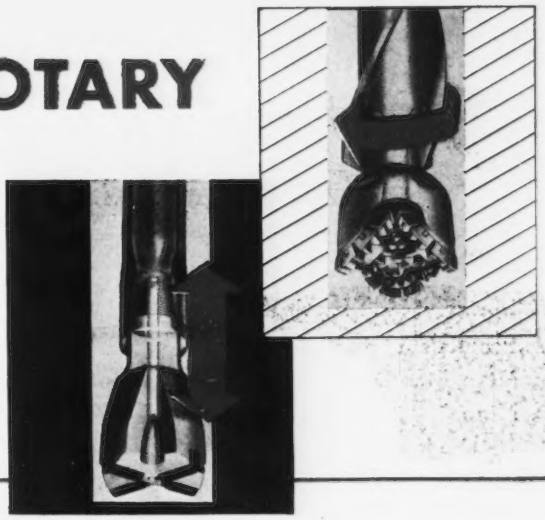
Representatives throughout the World

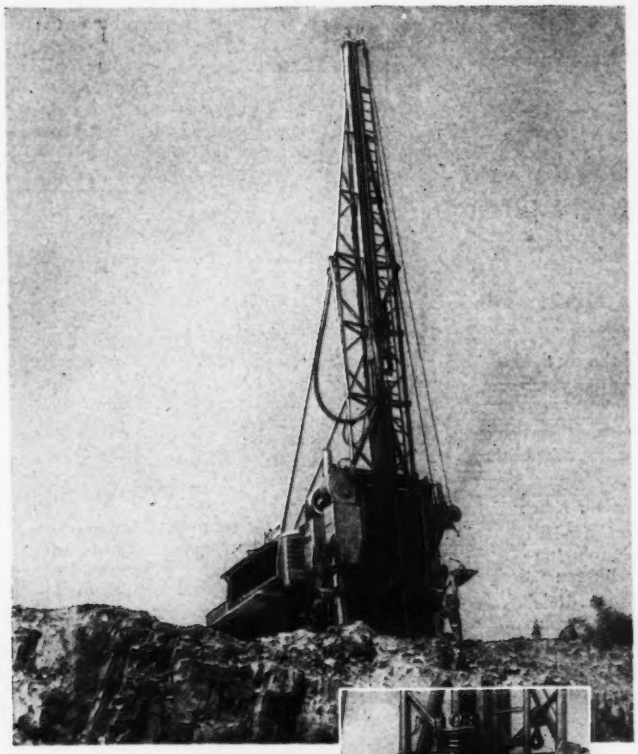
CENTRISEAL and HYDROSEAL

SAND, SLURRY & DREDGE PUMPS

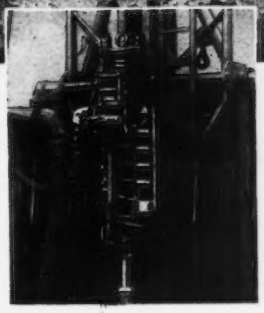
MAXIMIX RUBBER PROTECTED

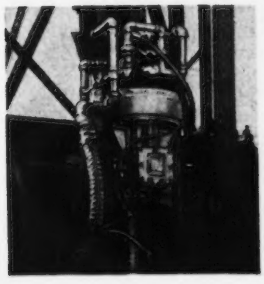
NOW— ROTARY OR PERCUSSION DRILLING with One Machine!





Powerful air-operated piston drill strikes 200 blows per minute—uses Carset bits up to 6½" and drills from 10 to 50 Ft. per hour, depending on the rock.





The rotary drill head is operated by powerful twin multivane-type air-motors—uses rotary type bits up to 9" and drills 20 to 150 feet per hour depending on the rock.

NEW UNIVERSAL QUARRYMASTER

permits fastest drilling in any type of ground!

Here is the first *universal drill*—a completely self-contained, self-powered and self-propelled machine with interchangeable rotary and percussion drill units.

When equipped with the powerful *piston drill*, the Quarrymaster can drill any type of material from the hardest rock to consolidated top soils and hard pans. When a *rotary* drilling head is applied, it is ideal for the softer or less abrasive rocks and overburdens.

In open pit mining, whether your cap rock is hard and the ore soft, or vice versa, the Quarrymaster will drill either one at the fastest rate and the cheapest way possible. If you are a drilling contractor or quarry operator the dual principle gives you the right drill for any rock conditions, anywhere.

Conversion from one type to the other takes but a few hours and consists of simply removing one drill from the tower and replacing it with the other.

Call your Ingersoll-Rand branch office today for complete information on the new Quarrymaster. Or write for your copy of Bulletin No. 4153.

Ingersoll-Rand

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5-72

ROCK DRILLS • COMPRESSORS • AIR TOOLS • TURBO BLOWERS
CONDENSERS • CENTRIFUGAL PUMPS • OIL & GAS ENGINES

ENGINEERING AND MINING JOURNAL

88th YEAR OF PUBLICATION

VOL. 155 NO. 8

AUGUST 1954

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LETTERS

Aid For Scouts

SIR:

I am writing in the hope that you can help me round up a collection of rock, ore and other mineral specimens, small enough to handle, for study and identification purposes by Boy Scouts in the Susquehanna District, BSA, of Philadelphia, Pa.

Several years ago we had a good collection of minerals and ores which provided the Scouts with information for study. A disastrous fire in our troop room destroyed the entire collection. Many of our Scouts are extremely interested in the study, and specimens donated by your readers would provide the basis for their work. With the help of *E&MJ's* readers, I hope to get a goodly collection for that purpose.

The samples should be tagged with the name of the specimen, where obtained, and the name of the donor. They will then be tagged as a lasting memorial to the kindness of individuals who took the trouble to donate them and will encourage many young men to go on in the field of mining and geology. A thank you letter will be forthcoming from the Scout who uses the sample for study.

FRANCIS J. WILLIAMS
MAL Susquehanna District
Philadelphia Council, BSA
Philadelphia 32, Pa.

Ed: Mr. Williams, a printer at the firm which produces E&MJ, has been a leader in the Scouting movement in the Philadelphia area for more than 19 years.

Mexico's Export Tax

SIR:

I have recently returned from another trip to Mexico, where I talked with officers of the Fresnillo and Penoles companies in reference to the recent increase in the ad valorem export tax from 15.3% to 25.5%, which tax adds a heavy burden upon the metal mine owners. The heads of the mining companies have had meetings with the Minister of Finance and they now have hopes of getting the export tax reduced back to the 15.3% (rate).

Senator Alberto Terrones, president of the Primera Comision de Minas, told the Senate early in June that a great injustice had been done to the mining industry by (the) sudden increase in the ad valorem export tax and that its effect is to discourage further investment in mine exploration and development. He said that, from all points of view, it is necessary to stimulate mining activity in Mexico and not to destroy this creative industry, a most important basis of Mexican economy, by robbing it of its just profits through taxation.

The Senator stated that the risk element in mining must not be overlooked

(*Continued on p. 114*)

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

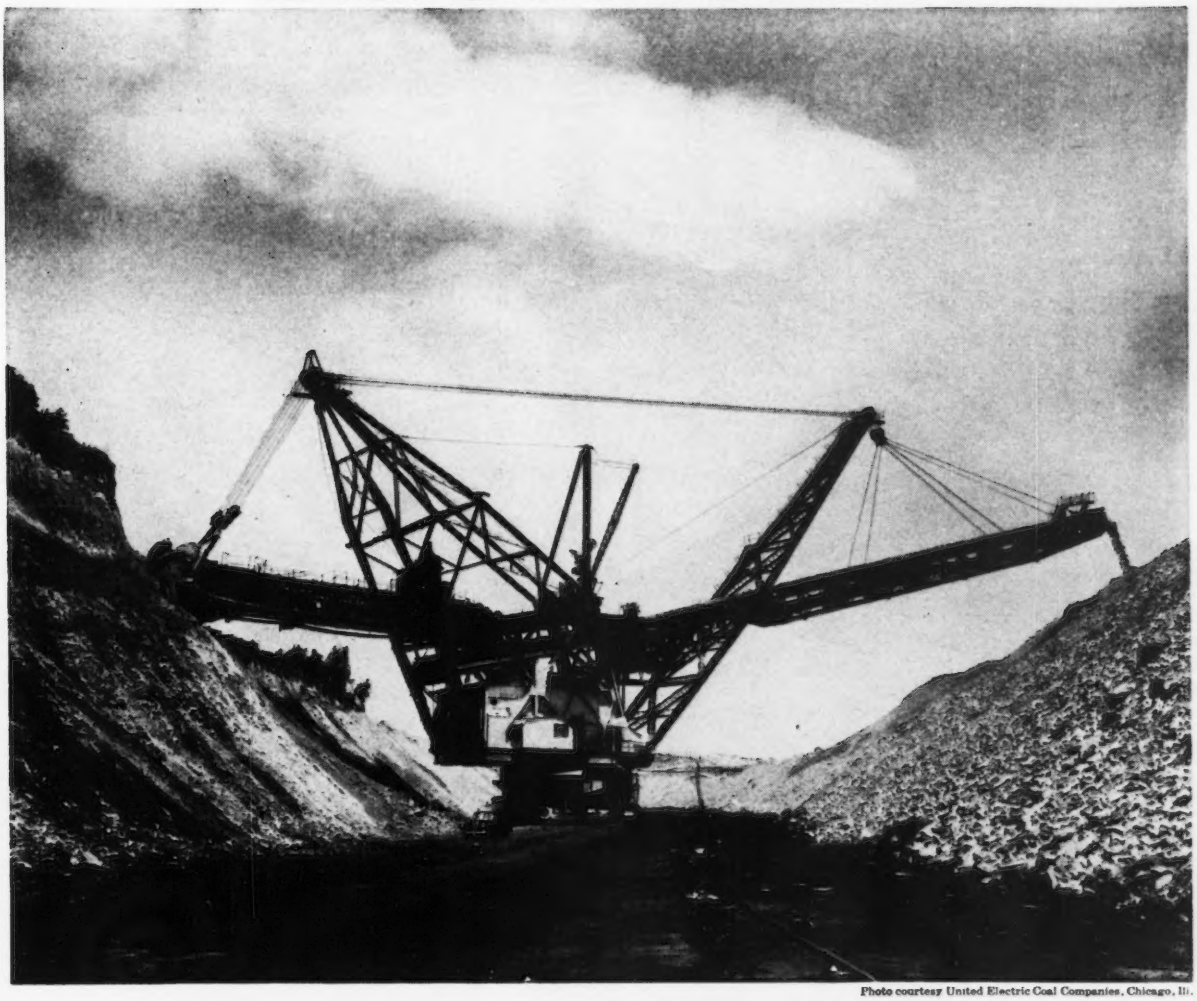


Photo courtesy United Electric Coal Companies, Chicago, Ill.

Chewing up the earth— 40 tons a minute

A typical example of B. F. Goodrich improvement in rubber

THAT machine strips overburden, exposing seams of coal that can then be mined. Huge buckets, bolted to the revolving wheel at left, bite into the earth, scoop it up and over onto a moving rubber belt that carries it away to be dumped.

But imagine the tearing jar on the belt from two-ton bucket loads of dirt and rock hitting it every few seconds, hour after hour. The banging and crashing would be enough to rip any ordinary belt to shreds.

Then a B. F. Goodrich man told the mine owner about the B. F. Goodrich *cord* belt. Cords, running lengthwise, are held in place by rubber. Under a sharp blow the cords can "give" temporarily, letting the rubber take the shock.

It was a new kind of belt—new, that is, 10 years ago when the belt was put to work on this job. Speed of strip mining increased 400%, the cost was lower because B. F. Goodrich had made improvements in a belt so it would stand rugged service like this.

Reducing costs for business is our business. Others may do it by cutting the original price. We do it by a constant program of improvement that results in products that stand harder use, last longer, and so cost far less when measured in terms of useful life. Don't be too sure that the service you are getting from belting, hose, tank linings or any rubber product is all you can expect until you learn what B. F. Goodrich has done recently to improve it. Call in your BFG distributor or write *The B. F. Goodrich Company, Dept. M-292, Akron 18, Ohio.*

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

START MORE EASILY

FOR OVER 20 YEARS, MORE COPPER ORE HAS BEEN MINED IN THE U.S. WITH TEXACO-LUBRICATED EQUIPMENT THAN WITH ANY OTHER

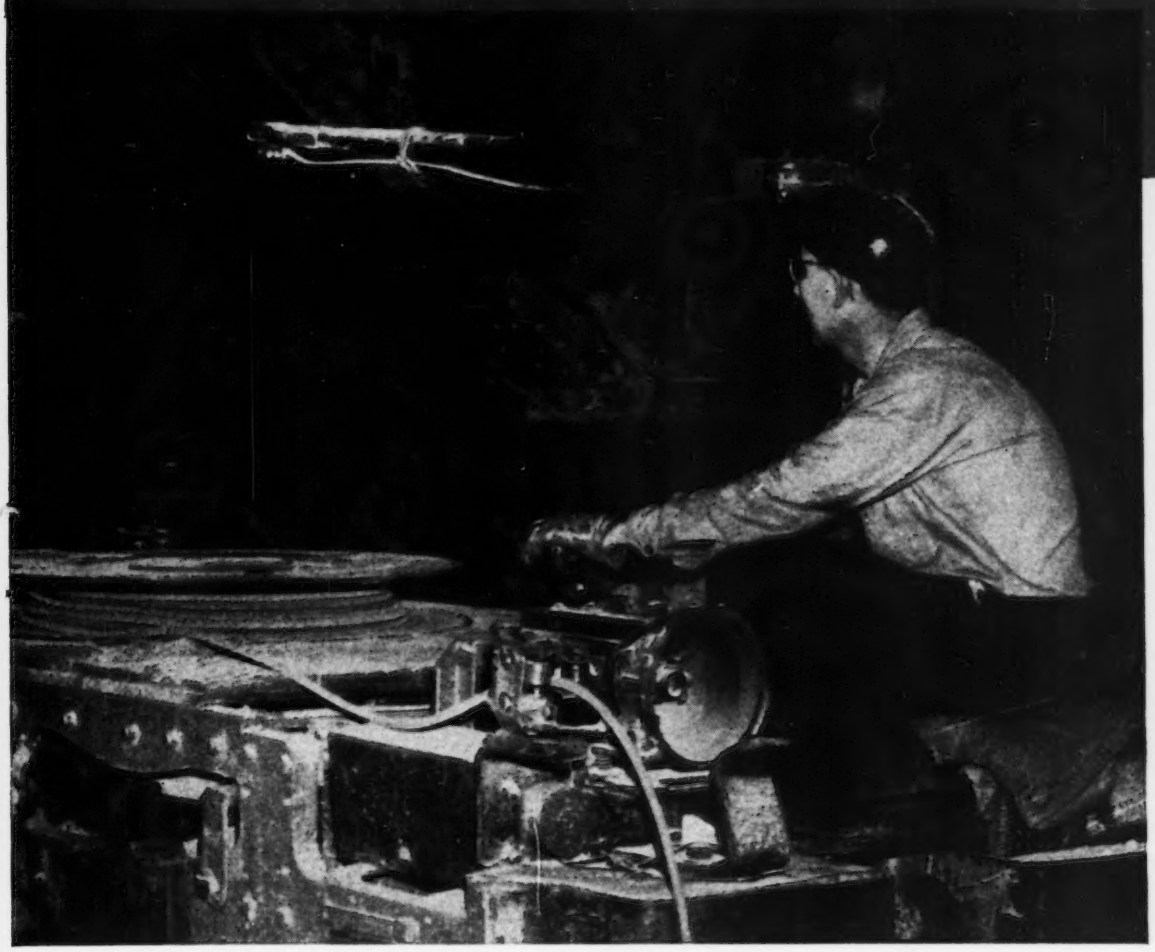
YOU CAN COUNT on starting your trains more easily—*winter as well as summer*—when car wheels are lubricated with *Texaco Olympian Grease.* That's because there's no "drag," so that start-ups are easier, movement smoother. Your locomotives can haul longer trains, move more tonnage per shift.

You'll realize, too, a saving in maintenance costs. *Texaco Olympian Grease* resists oxi-

TEXACO

TEXACO

...HAUL MORE CARS



dation and separation . . . stays *in* the bearings . . . seals out dirt and moisture . . . wards off wear. There are three consistencies of *Texaco Olympian Grease* to meet all requirements of plain, cavity hub and anti-friction bearings.

For open gears and wire rope, use *Texaco Crater* or, for easier application, *Texaco Crater X Fluid*. You'll get smoother gear performance, longer gear life . . . you'll keep your wire rope strong longer.

A Texaco Lubrication Engineer will gladly help you get the most out of your equipment, above and below ground. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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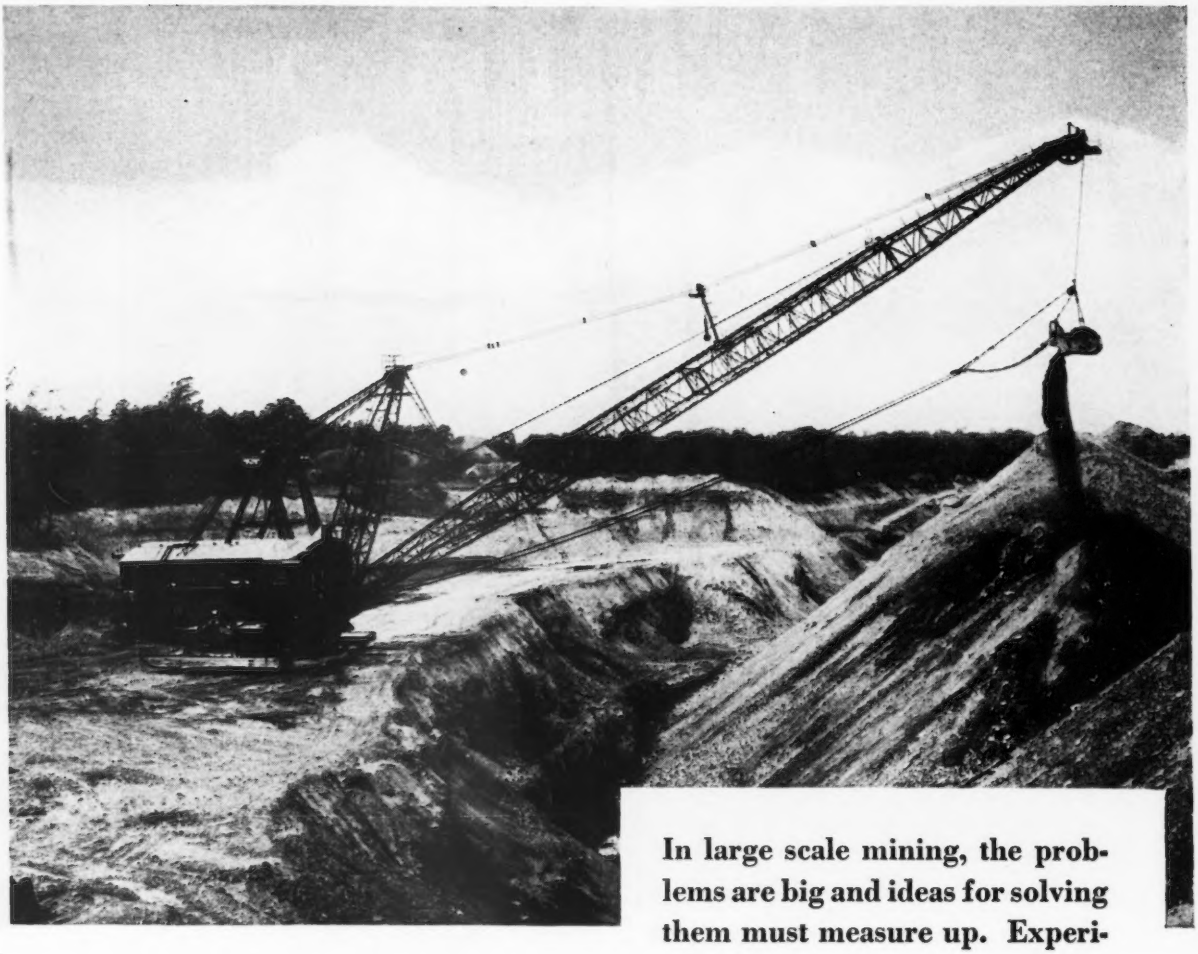
The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Lubricants and Fuels
FOR THE MINING INDUSTRY



No place for little ideas...

In large scale mining, the problems are big and ideas for solving them must measure up. Experienced strip mine operators know that Bucyrus-Erie stripping shovels and draglines offer the right answer – really big output, along with dependability and economical operation. In addition they provide long working ranges, time-saving maneuverability, and the basic simplicity of design that means low maintenance costs.

If your mining operation requires the economical handling of big yardages, investigate Bucyrus-Erie stripping shovels and draglines. 17154

BUCYRUS ERIE

South Milwaukee, Wisconsin

It's a Fact!

JOY AXIVANE® MINE BLOWERS

produce more air per horsepower

You don't have to make complicated tests to check the efficiency of Joy blowers. Just compare the performance data we can quickly make available to you with the published performance data of conventional mine blowers. That will give you positive proof that the mechanical efficiency of Joy blowers is unexcelled for high or low pressure operations.

Moreover, the pressure range in which AXIVANE blowers operate with unequalled efficiency is so wide that it is totally unnecessary to have one type of blower for short lengths of tubing and another type for longer lengths. The Joy AXIVANE mine blower will operate through any length of tubing with high efficiency.

Built in two sizes (3 and 5 H.P.) to handle most blowing jobs. For greater duties, AXIVANE fans from 5 to 3000 H.P. are available. ● Write for data—let us work with you.

AERODYNAMIC DESIGN

The blades of Joy blowers are of airfoil shape, similar in cross-section to an airplane wing. Rotors are of cast-aluminum construction, permitting accurate adherence to the design shape. Both the number and shape of the blades and stationary vanes are mathematically determined to insure greatest efficiency. The minute clearance between blade-tip and blower casing eliminates most tip loss, a common cause of fan inefficiency and noisy operation.

VANEAXIAL CONSTRUCTION

Joy blowers have stationary vanes to recover the rotative energy imparted to the air by the rotor. The airflow from AXIVANE blowers is therefore substantially axial. The unequalized outlet pressures of all other fan types create non-axial, turbulent airflow, which is wasteful of power. Joy blowers consequently give you a more favorable electric-to-air-power ratio, and are relatively quiet in operation.

Write for Bulletin J-607, or . . .

Consult a Joy Engineer

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JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

Increase your footage

Use CLEVELAND Air Legs and Drills...the easiest way

THE FEED YOU NEED — FROM ZERO FEED TO FULL LINE

Eleven detent positions enable drill operator to set and maintain pressures in a range from zero to full-line feeding pressure — with an increase of 9 psi at each setting. That's why a CLEVELAND Air Leg and H10AL Drill combination gives top performance in any kind of rock.

Shown here is a **CLEVELAND AL-92** Telescopic Air Leg with H10AL Drill. Because of space limitations, full length isn't shown.

CLEVELAND AL-92 Telescopic Air Leg with H10AL Drill and exclusive 11-position feed control

SPECIFICATIONS

Standard, automatic controlled wet-type backhead.

Chuck sizes	7/8" x 4¼" — or other popular steel shank sizes	
Weight	60 lbs.	
Air Hose	¾"	
Water Hose	½"	
Full feed travel	4'	6'
Collapsed feed	2' ea. piston	3' ea. piston
Closed length	48"	60"
Extended length	96"	132"
Air leg weight	37 lbs.	42 lbs.

CLEVELAND AL-90 Single Extension Air Leg for use with H10AL Drill and exclusive 11-position feed control

SPECIFICATIONS

Weight	60 lbs.
Air Hose	¾"
Water Hose	½"
Feed Travel	36" — 48" — 60"
Closed Length	56¾" — 69" — 81¼"
Extended Length	92¾" — 117" — 141¼"
Air Leg Weight	30 lbs. — 34 lbs. — 37 lbs.

CLEVELAND AL-91 Single-Extension Air Leg for use with any 35-lb., 45-lb., or 55-lb. class rock drill. Feed control built into air leg.

SPECIFICATIONS

Standard wet, or automatic controlled, wet-type backhead available.

Air hose	¾"
Water hose	½"
Feed travel	36" — 48" — 60"
Closed length	58" — 71" — 83"
Extended length	94" — 119" — 143"
Air leg weight	35 lbs. — 38 lbs. — 41 lbs.

per man-shift!

to drill rock

Choose the drilling combination that's best for you from the industry's only complete line of telescopic or single-extension air legs.

MINERS like to use a CLEVELAND Air Leg and H10AL Drill combination. It gives them real flexibility — they can use it as a drifter . . . as a stoper . . . or as a hand-held drill . . . set-ups are quick and easy.

It's an easy-handling combination, also. The air leg supports the drill and absorbs fatiguing recoil. You get flexible feeding pressure, too — from zero to full line. That's why miners drill more footage with CLEVELAND, yet are less tired at the end of their shift.

Exclusive CLEVELAND built-in feed control in the H10AL Drill eliminates a third hose and cumbersome "Y" connections. There's no feed-control bleed valve — the operator doesn't have to bleed off air continuously, to maintain suitable feeding pressure. He can change or advance the position of the leg easily and quickly.

The air leg holds the drill in line with the hole — thus reducing front-end drill wear and practically eliminating rotation strains.

These are ways a CLEVELAND Air Leg and H10AL Drill combination helps you get more drilling for less cost. Take advantage of them.

Write today for Bulletin RD-30 for complete information.

CLEVELAND AL-93 Telescopic Air Leg for use with any 35-lb., 45-lb., or 55-lb. class rock drill. Feed control built into air leg.

SPECIFICATIONS

Full Feed Travel	4′	6′
Collapsed Feed	2′ ea. piston	3′ ea. piston
Closed Length	50″	62″
Extended Length	98″	134″
Air Leg Weight	42 lbs.	47 lbs.

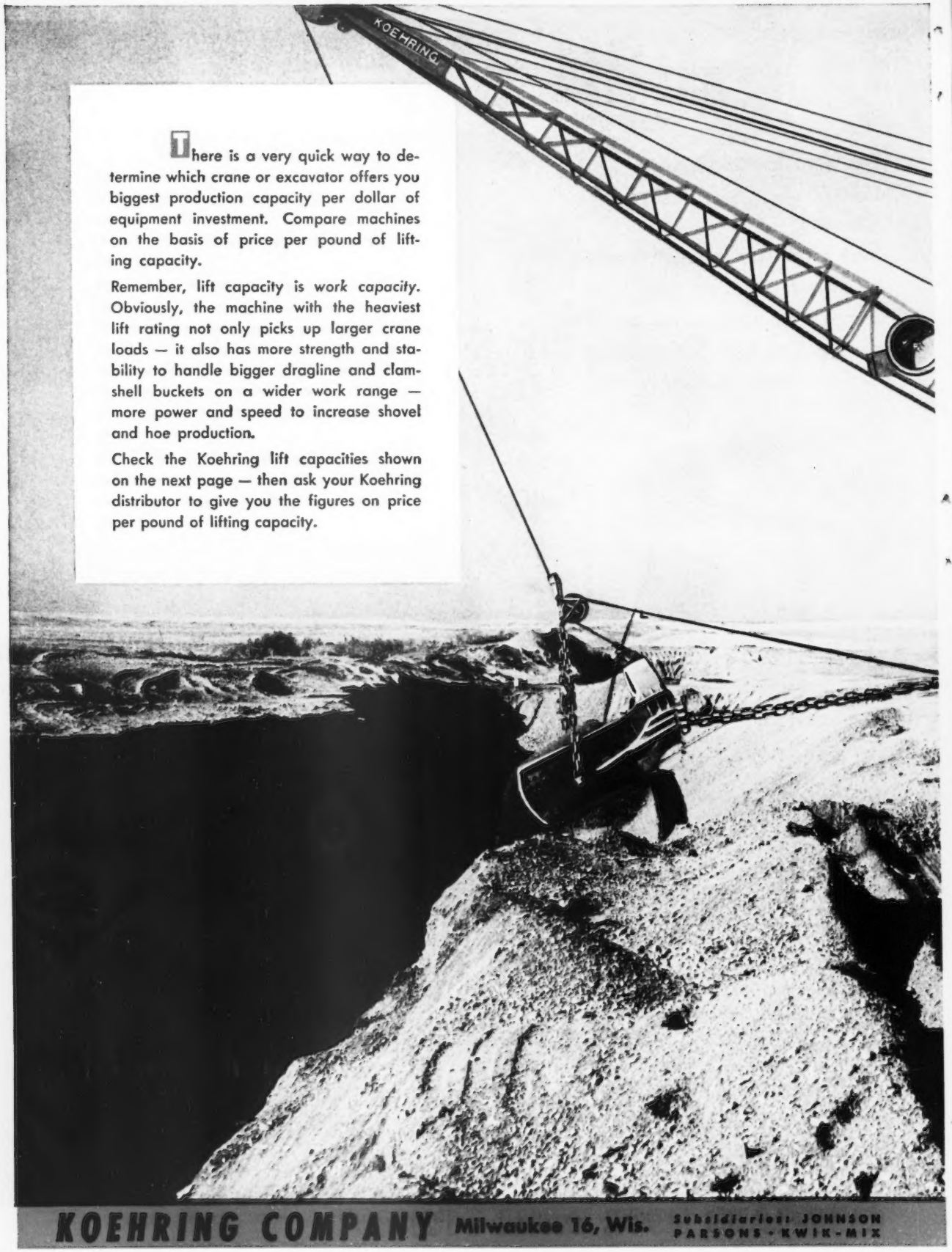
CLEVELAND ROCK DRILL DIVISION

Le Roi Company

A Subsidiary of Westinghouse Air Brake Co.

12500 BEREA ROAD • CLEVELAND 11, OHIO RD-59

Plants: Milwaukee, Wisconsin • Cleveland — Greenwich — Dunkirk, Ohio • Coldwater, Michigan

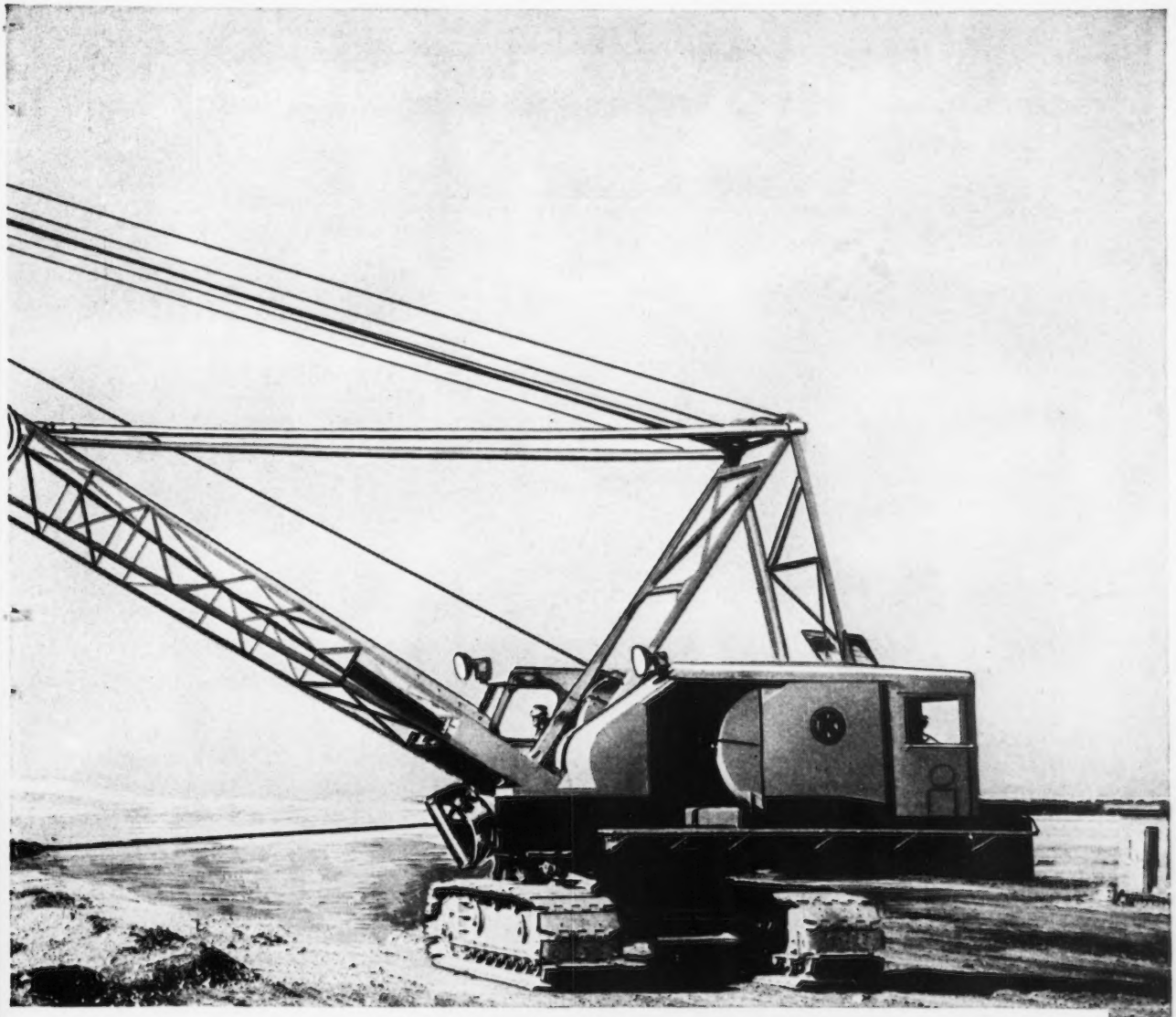


There is a very quick way to determine which crane or excavator offers you biggest production capacity per dollar of equipment investment. Compare machines on the basis of price per pound of lifting capacity.

Remember, lift capacity is *work capacity*. Obviously, the machine with the heaviest lift rating not only picks up larger crane loads — it also has more strength and stability to handle bigger dragline and clamshell buckets on a wider work range — more power and speed to increase shovel and hoe production.

Check the Koehring lift capacities shown on the next page — then ask your Koehring distributor to give you the figures on price per pound of lifting capacity.

KOEHRING COMPANY Milwaukee 16, Wis. Subsidiaries: JOHNSON PARSONS · KWIK-MIX



Check price per pound of lifting capacity

KOEHRING MODEL	SIZE DIPPER	KOEHRING LIFT CAPACITIES (Crawler ratings based on 75% of tipping load. Rubber-tired machines — 85% of tipping load)		PRICE PER POUND OF LIFT CAPACITY*
205 CRAWLER	½-Yd.	20,000 lbs.	30-foot boom at 10-ft. radius	?
205 ON RUBBER	½-Yd.	30,000 lbs.	25-foot boom at 12-ft. radius	?
304 CRAWLER	¾-Yd.	27,800 lbs.	35-foot boom at 12-ft. radius	?
304 ON RUBBER	¾-Yd.	50,000 lbs.	30-foot boom at 10-ft. radius	?
405 CRAWLER	1-Yd.	40,000 lbs.	40-foot boom at 12-ft. radius	?
605 CRAWLER	1½-Yds.	72,300 lbs.	50-foot boom at 12-ft. radius	?
1005 CRAWLER	2½-Yds.	159,000 lbs.	50-foot boom at 12-ft. radius	?

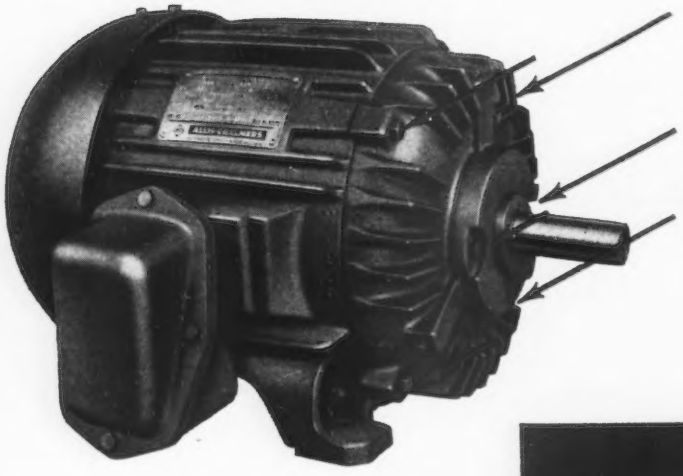
KOEHRING HEAVY DUTY

*Figures available on request—ask your Koehring distributor for them.

K430

Here's motor superiority

you can see

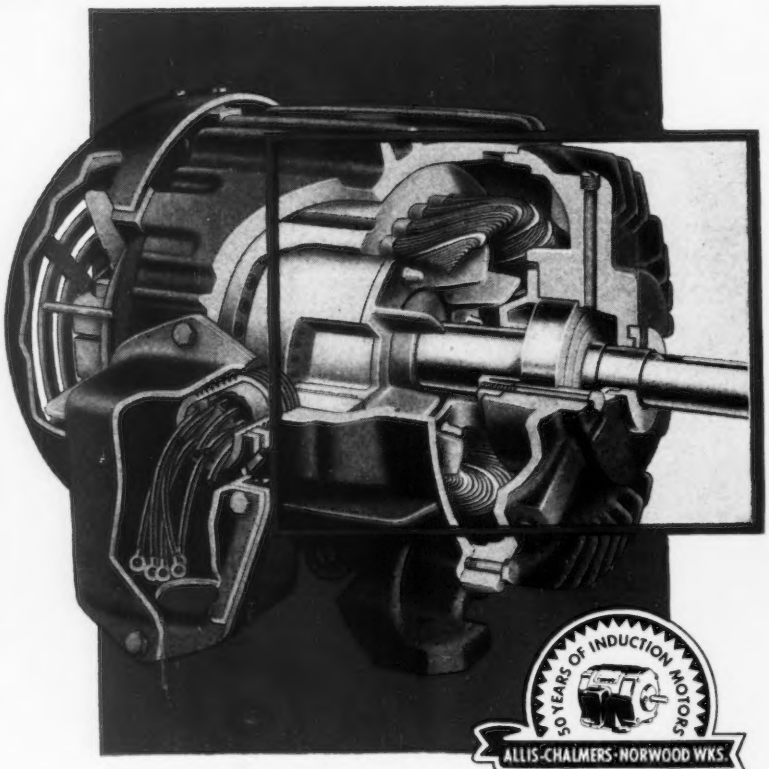


It takes 6 bolts not just 4 to give full bearing protection

THE TWO EXTRA BOLTS in the end housing of every Allis-Chalmers ball bearing motor are the proof of *extra* protection against bearing failure. These are the bolts that hold the bearing cap tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure . . . protects the grease and the bearing against contamination from dirt and moisture.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.

Result? Allis-Chalmers motors pay off in longer, trouble-free bearing life, lower motor maintenance.



Get all the facts . . . judge for yourself — Compare Allis-Chalmers motors with other motors. Get the six-bolt construction that gives you complete bearing protection. For proof, see your Allis-Chalmers Office or Authorized Distributor, or write — Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-C ALLIS CHALMERS

A-4441

Making LIGHT STUFF out of HEAVY DIGGING!

● This Northwest is in the pit of the Carolina Solite Corp. at Aquadale, N. C. It is handling a material classed as Monroe slate which is made into a lightweight aggregate.

Monroe slate is largely SiO_2—hence it is tough—almost entirely quartz and it has a hardness of nearly 7. It must be drilled and blasted before loading and unlike many slates, it breaks into blocky chunks.

The loading is done with a 1½ yd. Northwest which is one of 6 Northwests bought by the Carolina Solite Corp. and its parent company the Southern Lightweight Aggregate Co. of Richmond, Va. Northwests are built for tough mining work like this. The Dual Independent Crowd utilizes force most other independent crowd shovels waste, giving the extra push for hard rock work. The "Feather-Touch" Clutch Control makes operation easy without resorting to delicate pumps, compressors and valves. Cast steel machinery bases and side frames take the shocks of heavy digging and the Cushion Clutch eliminates overloads before they can damage operating machinery. These are but a few of the many advantages that make the Northwest a *real* Rock Shovel.

If you are modernizing or have a pit problem let a Northwest man tell you the whole story.

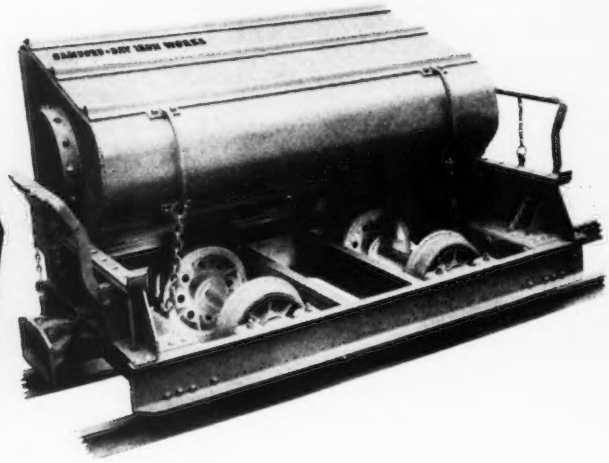
NORTHWEST ENGINEERING CO.
1509 Field Building, 135 South La Salle Street,
Chicago 3, Illinois

NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem

Need a Rocker Car that handles 90 lbs. per cubic foot...

or one that handles 180 lbs. per cubic foot...



THE PRIMARY CAUSE of high maintenance costs and short car life is the purchase of cars that are not constructed properly to handle the materials being mined. Our S-D Rocker Car built to handle 90 lbs. per cubic foot is more rugged in construction than many rocker cars in use today. It will handle such materials as limestone rock with practically no repair cost and minimum maintenance over many years, but, to expect this car to handle heavier materials such as iron ore is asking it to do something it is not capable of doing. We all recognize the difference in materials being mined and it is just as important that we recognize the need for cars different in design and construction. Our S-D Rocker Car with outside frame construction, spring mounted trucks, 3/8" side plates, 1/2" end plate and bottom plate, and 1/2" bottom liner is the ultimate in strength. Materials weighing 180 lbs. per cubic foot, such as iron ore, require this ruggedly constructed car for the greatest economy rocker cars can provide.

We want to urge you to be sure to get cars designed and constructed to meet your requirements. The surest method of obtaining the right cars is taking up your problems with us. After successfully designing and building mine cars of all types to meet scores of coal, metal and non-metallic haulage requirements, a manufacturer with this experience and know-how is worth something to you. That is the position Sanford-Day is in today.

Take advantage of our qualified sales representatives who are capable of going over your haulage system, analyzing and recommending the design to meet your particular problem. We have engineers who have spent a lifetime doing nothing but designing mine cars. The service of these specialists are yours for the asking.

Sanford-Day Iron Works, Inc., P. O. Box 1511, Telephone: 3-4191, Knoxville, Tenn.

Plan to attend the Metal and Non-metallic Show in San Francisco, Sept. 20-24. Drop by and discuss your problems with us at Booth 314.

Sanford-Day IRON WORKS

KNOXVILLE • TENNESSEE

BROWN-FAYRO DIVISION JOHNSTOWN, PA.

MINE CARS, All Types - PRECISION WHEELS - "Brownie" HOISTS CAR RETARDERS - SPOTTERS PUMPS - OIL SPRAY SYSTEMS

. . . JOY DRILL JIB/TRACTOR COMBO

CUTS DRILLING COSTS 56¢ A TON!

A uranium mining company made their own Drill-mobile by mounting two Joy LM-67 Drills with 6′ chain feeds and Hydro Drill Jibs on a diesel tractor. Immediate result was an 80% reduction in labor costs!

This "Jib-Tractor" easily drills out two faces a shift. Each face consists of 80 to 100 holes and is 18′ wide and 18′ to 20′ high. The Joy extendable Jibs drill horizontal holes up to the 18′ height and slanted holes at the 20′ height.

Average drilling speed in the sandstone formation ranged from 30″ to 36″ per minute. Average footage drilled and broken is 7 feet. Ground broken per round is estimated at 150 tons.

Previously, air legs and stopers were used for drilling. The following comparison table illustrates the considerable saving in drilling costs with this new "Jib-Tractor":

FORMATION.....Sandstone
DRIFT SECTION.....18′ x 20′
HOLES PER FACE.....120 to 130

	Jib-Tractor	Air Legs & Stopers
Rounds drilled per shift	2	½
Tons broken per shift	360	87
Labor cost per shift	$40	$60
Labor cost per ton	14c	70c
Saving per ton	56c	—

For more information on Joy Drills and Hydro Drill Jibs, write for Bulletin 87-F to *Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.* In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

for AIR COMPRESSORS, ROCK DRILLS, HOISTS AND SLUSHERS

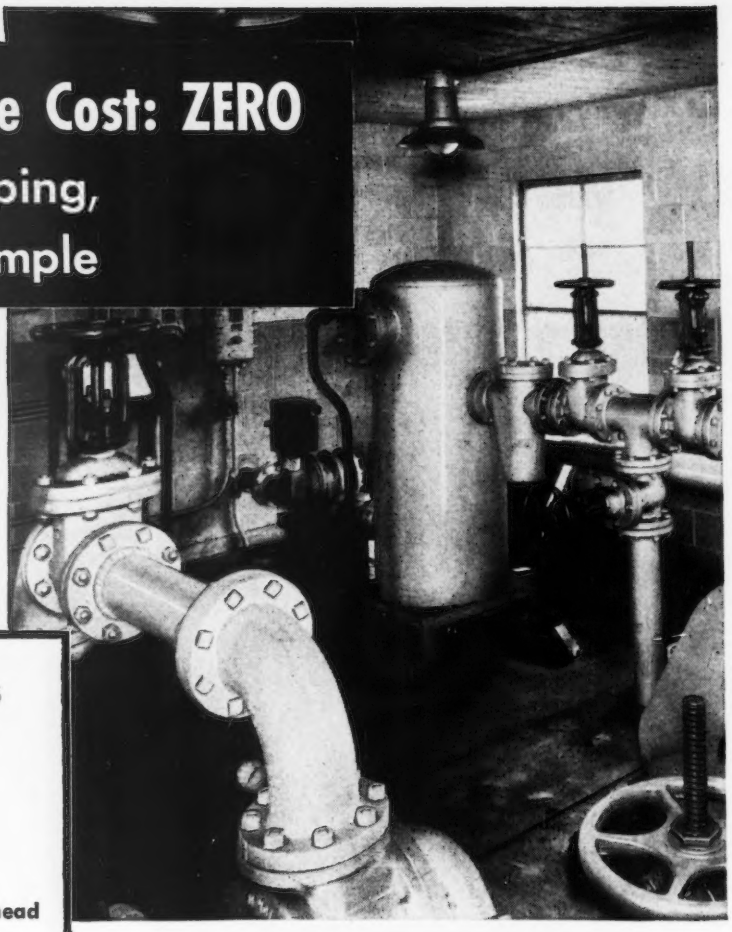
JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

W&D M5308

Valve Maintenance Cost: ZERO

...on fuel oil piping, for example



The Installation

At North End Yard, The Cincinnati Union Terminal Railroad, using Crane steel valves and fittings throughout diesel fuel receiving and filling system. Working pressure, 40 pounds.

Valve Service Ratings

SUITABILITY:
Doing the job as intended

FEATURES:
Exelloy seating

MAINTENANCE COST:
Zero

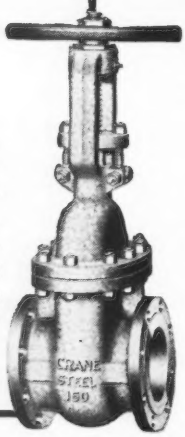
SERVICE LIFE:
Installed 1948—Shows long life ahead

OPERATING RESULTS:
Low-cost, trouble-free fueling

AVAILABILITY:
Crane catalog item—No. 47X

The Valve

150-Pound Steel Gate—with its exceptional performance assured by Crane quality design . . . by Crane pioneering skill in steel casting . . . and the high adaptability of Crane Exelloy trim for oil services. Sizes 2 to 24 in.; screwed, flanged, or welding ends. See your Crane Catalog, or ask your Crane Representative.



The Case History

Not until the terminal's engineers were convinced of its dependability and low-cost maintenance was any equipment bought for this project. Many similar systems were studied for the best means of assuring utmost economy of operation. The installation was made in 1948 . . . with welded piping where practical, using Crane materials exclusively—steel fittings, check valves, and No. 47X, 150-Pound steel gate valves.

More than 5 years later the terminal reports: Piping system operation entirely satisfactory; maintenance cost to date: zero. Further result: Crane valves have earned top consideration for proposed extension of system. The terminal knows the value of thrifty buying—quality always outweighs price-tag savings.

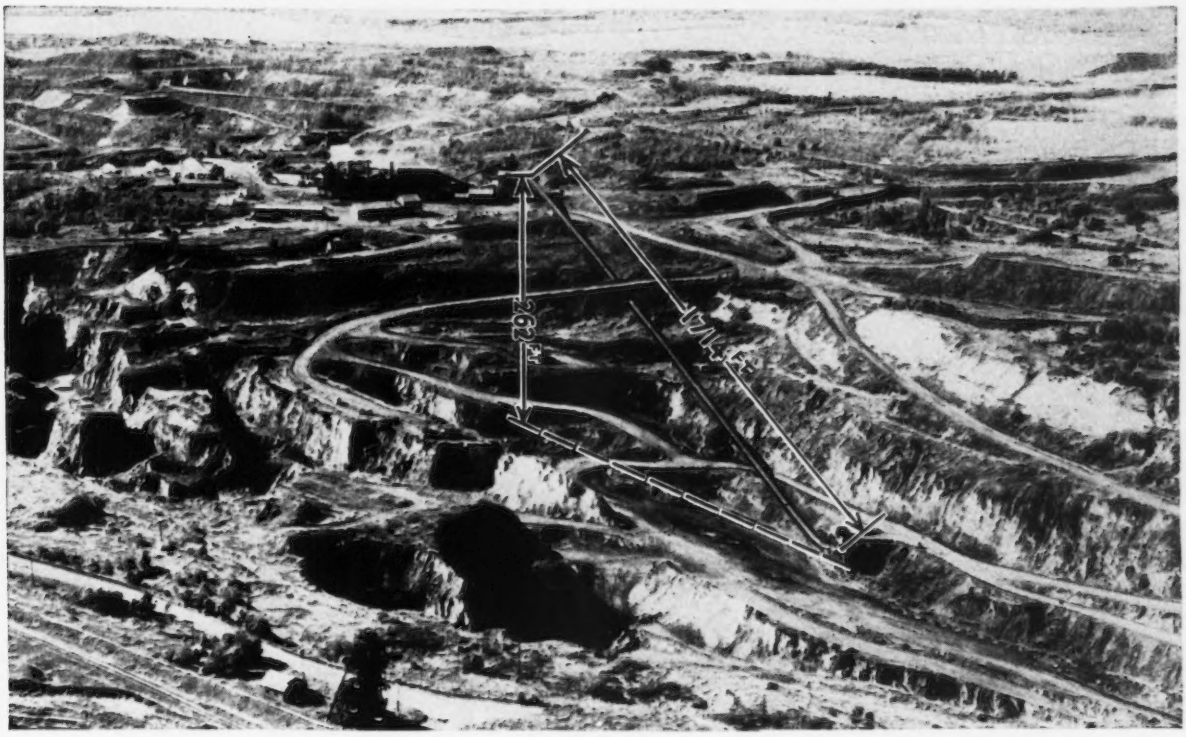
THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

Planning an ore handling project?



Straight as an arrow, Link-Belt roller bearing belt conveyor rises from iron ore pit floor to concentrating plant. Almost one-third of a mile long, its uninterrupted delivery of high tonnages permits far lower handling costs than other forms of transportation.

LINK-BELT accepts complete responsibility for design, equipment, erection and performance

As mineral deposits grow leaner, larger and larger tonnages must be handled to recover concentrates in quantities to meet ever-increasing demands. At the same time, the processing of many ores has become more complex. These are two good reasons why it pays to call in Link-Belt if you're planning an ore handling project.

For Link-Belt will accept complete responsibility for the design, erection and furnishing of systems for handling ore and overburden—plus responsibility for satisfactory performance.

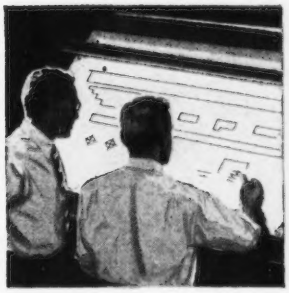
An installation—typical of many on which Link-Belt has performed this overall function—might move huge tonnages from the mine . . . process, store and reclaim the material . . . finally carry it to rail or dockside and load it out.

Get the facts on how this single *proved* source can integrate every factor of any contemplated project, large or small. A call to the Link-Belt office near you will place Link-Belt's broad engineering facilities at your disposal.

LINK-BELT

PROCESSING AND HANDLING EQUIPMENT 13.338

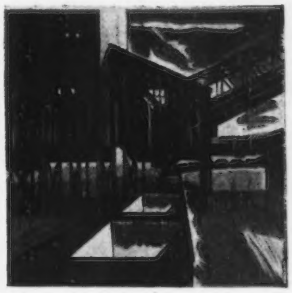
LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.



OVERALL ENGINEERING. Experienced design and field engineering staffs integrate all factors, assure expert planning.

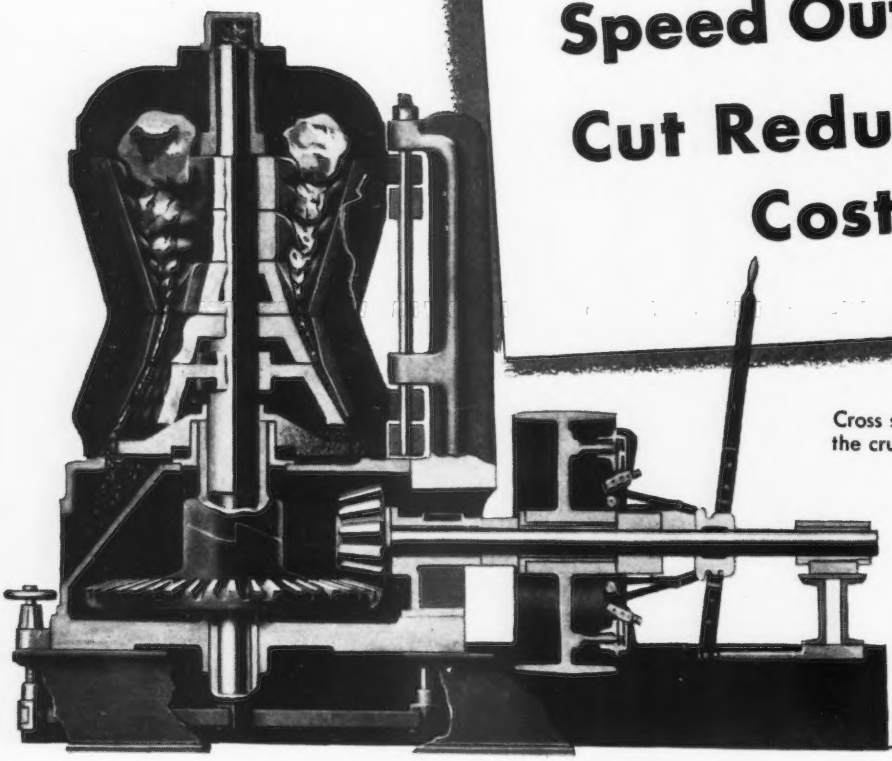
DEPENDABLE EQUIPMENT. From Link-Belt's broad line, you get equipment that will stand up under the toughest jobs.

COMPLETE ERECTION. Experienced Link-Belt superintendents, staffs and skilled crews carry through on every detail.



SATISFACTORY PERFORMANCE. When you rely on Link-Belt as a source, we accept responsibility for successful operation.

Here's How to Speed Output... Cut Reduction Cost



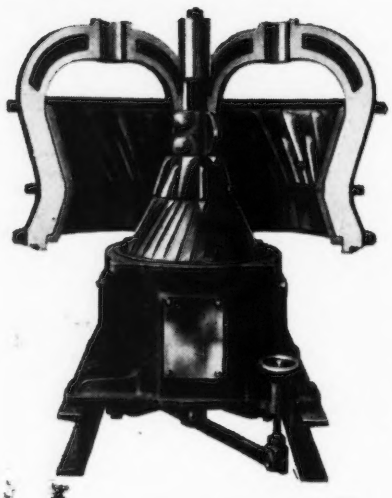
Cross section view illustrating the crushing action.

Use STURTEVANT Rotary Fine CRUSHERS

With the Sturtevant Rotary Fine Crushers you can crush or granulate to even sizes without excess dust. By simply turning the handwheel, the crusher can be quickly regulated to crush down to approximately ¼" and finer, or opened up to produce 1" size of finished product.

"Open-door" accessibility permits fast, easy, thorough cleaning.

Sturtevant Rotary Fine Crushers crush fast... do not clog. Available in output capacities from 1 to 30 tons per hour.

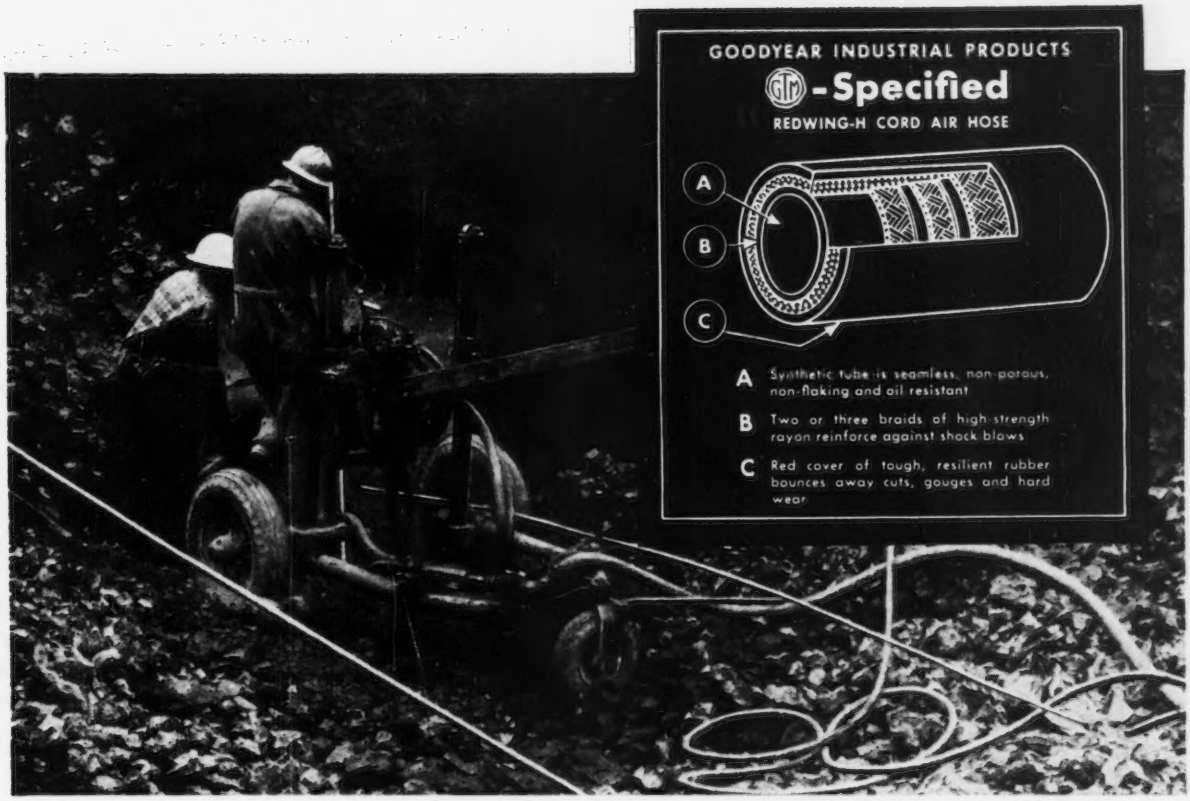


Sturtevant Mill Company

101 CLAYTON STREET, BOSTON 22, MASSACHUSETTS

Designers and Manufacturers of

CRUSHERS • GRINDERS • SEPARATORS
CONVEYORS • MECHANICAL DENS and
EXCAVATORS • ELEVATORS • MIXERS


GOODYEAR INDUSTRIAL PRODUCTS
G.T.M.-Specified
REDWING-H CORD AIR HOSE
A
B
C
A Synthetic tube is seamless, non-porous, non-flaking and oil resistant
B Two or three braids of high-strength rayon reinforce against shock blows
C Red cover of tough, resilient rubber bounces away cuts, gouges and hard wear

Redwing—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

ROCK-BOTTOM DRILLING COSTS
come with REDWING-H Air Hose

ULTIMATE cost — based on the service rendered per dollar expended — not initial price, is the true measure of hose value. That's why REDWING-H Cord Air Hose deserves your first and full consideration. You'll find it gives you the lowest ultimate cost under the toughest conditions found in mines, quarries or on any construction job.

And that's because this hose is designed to its job by the G.T.M. —Goodyear Technical Man. The bright, red cover is of a soft, cut-resistant stock that effectively cushions against the sharpest blows and most jagged rock. Under this wear-resistant cushion are multiple, vertical braids of double end rayon cords to handle working pressures up to 300 psi with extreme flexibility. All this plus a seamless, non-porous, non-flaking, oil-resistant tube.

See the G.T.M., or your Goodyear Distributor, on how to get the most for your dollar with REDWING-H Air Hose or any of the many other types of hose specifically designed for use in excavation and construction work. Or write to:

Goodyear, Industrial Products
Division, Akron 16, Ohio.

Your Goodyear Distributor *can quickly supply you with Hose, Flat Belts, V-Belts, Packing or Rolls. Look for him in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods."*

GOODYEAR

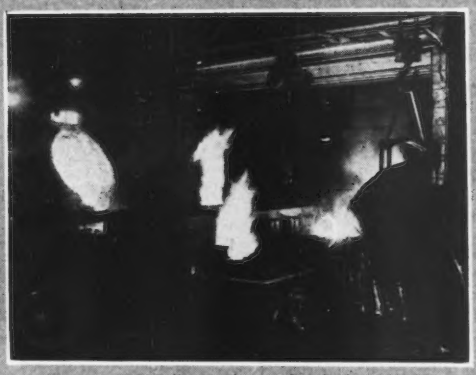
THE GREATEST NAME IN RUBBER

We think you'll like THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network

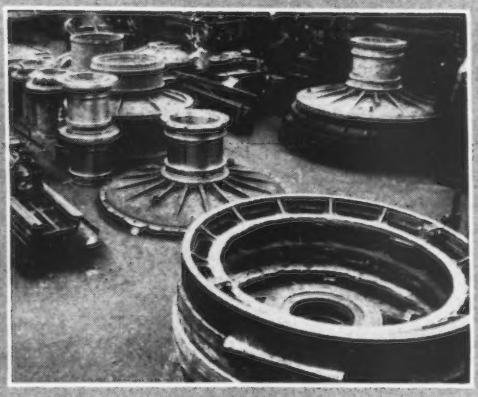
how MARCY MILL leadership in mechanical performance can help you cut costs

Grinding mills are selected on the basis of low-cost-per-ton output resulting from efficient, dependable mechanical and metallurgical performance. That's why so many successful mining companies throughout the world continue to order **and reorder** Marcy* Grate Discharge Ball Mills and Marcy Open End Rod Mills.

for example...



Pouring 25,000 lb. Meehanite heads for 10'x 10' Marcy Ball Mill, in Mine and Smelter foundry.



Typical group of Meehanite parts used on Marcy Ball and Rod Mills.

...MEEHANITE-METAL PARTS

Meehanite is a copyrighted trade name for a closely controlled iron, molded to rigid physical properties for uniform structure and strength, combined with good machinability. Meehanite metal is used in the construction of Marcy Mill heads, spur gears, bearings, and other castings. It has been selected for these uses since it is possible to have definite pre-determined and uniform properties for each application. Such properties may be varied to meet certain conditions and may be reproduced at any time without variation. Meehanite, due to its uniform density, high tensile strength, fatigue strength, rigidity and impact strength, provides qualities of toughness and resilience.

The use of Meehanite Metal is just one of the many Marcy Mill features which assure long, trouble-free operation and minimum maintenance... and which result in low-cost-per-ton production.

*Both Marcy and Massco are registered trademarks.

Licensed Manufacturers and Sales Representatives:
Canadian Vickers, Ltd., Montreal, Canada
The Austral Otis Eng. Co., Ltd., So. Melbourne, Austr.
Morgardshammers Mek. Verkstads Aktiebolag, Mogardshammar, Sweden
Pegson Limited (for England & Africa) Coalville, Leicestershire, England

Sales Agents:
W. R. Judson, Santiago, Chile
The Edward J. Nell Co., Manila, P. I.
The Ore & Chemical Corporation, 80 Broad Street, New York City 4, New York
Representatives for Continental Europe

WRITE FOR CATALOG

The Mine & Smelter Supply Co.
Denver 17, Colorado

OFFICES IN SALT LAKE CITY, EL PASO, 1775 BROADWAY, N. Y. C.

1 STEP UP SHOVEL SPEED, YARDAGE. This shovel performs faster, more smoothly, thanks to G-E drive system with amplidyne control. Digging power is increased. The G-E amplidyne system improves response and acceleration. It controls shovel motions precisely, and also prevents excessive current and torque peaks which might damage equipment.

5 ways General Electric can help you mine more tons per man-hour

1. **Step up shovel speed, yardage**
2. **Haul more ore**
3. **Get full voltage at point of use**
4. **Cut relocation time**
5. **Increase drill footage**

SEE NEXT PAGE FOR DETAILS

GENERAL ELECTRIC

2 HAUL MORE ORE. High availability of General Electric locomotives means you can haul greater tonnages. In normal use, G-E locomotives are on the job 24 hours a day, seven days a week, with little time required for maintenance.

G-E ENGINEERED ELECTRICAL SYSTEMS MEAN

Faster open pit mining at less cost

You need speed, flexibility, and safety in your open pit mining operations if you are to meet present demands for higher production per man-hour. General Electric's modern, engineered electrical systems can help you do this in five ways:

1. You can speed up the digging cycle. G-E amplidyne-controlled drives provide faster hoist, swing, and crowd action on power shovels. Shovels work around the clock with minimum time lost for maintenance or repairs.

2. You can haul greater tonnages. G-E locomotives have outstanding records for high availability. They maneuver rapidly, efficiently, and help speed all switching operations. Easily accessible for maintenance.

3. You can increase mining efficiency and safety with G-E unit substations. They improve voltage levels—make full equipment capacity available. Distribution losses are reduced. Grounding systems help protect personnel and equipment.

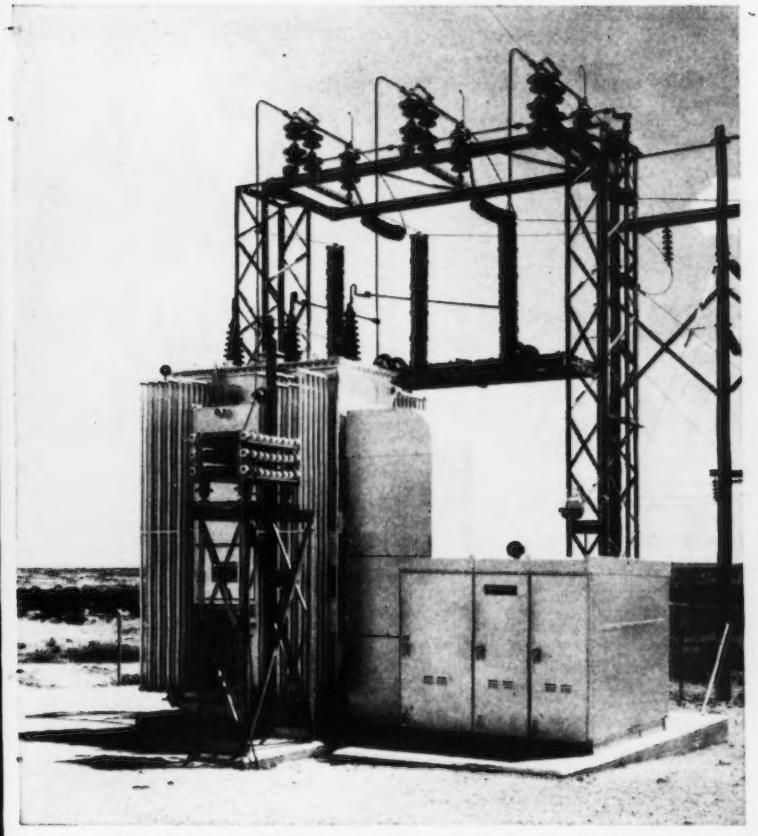
4. G-E cable-skid switch houses give a more flexible power system arrangement. You can cut relocation time of all equipment. Moving is simplified. Cable connecting time is minimized.

5. You can step up drilling speed. Modern rotary and churn drills, powered by General Electric, are self-propelled. Smooth, fast control and rugged motors help them to drill harder rock at higher speeds.

These production-boosting techniques can be applied to your surface mining operation. A G-E mining industry specialist can show you how. Contact him at your nearest G-E Apparatus Sales Office. General Electric Company, Schenectady 5, New York. 660-31

Engineered Electrical Systems for the Mining Industry

GENERAL ELECTRIC



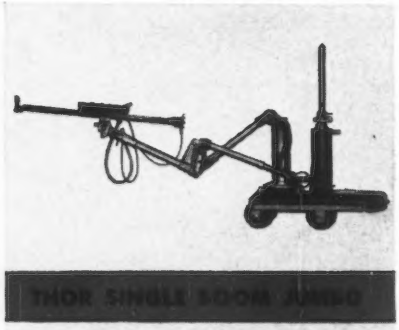
3 GET FULL VOLTAGE AT POINT OF USE by locating G-E factory-assembled unit substations near work area for full equipment capacity. Magne-blast breakers help protect feeders; lightning arresters help prevent outages; grounding resistors increase safety.

4 CUT RELOCATION TIME. Standard G-E cable-skid switch house has polarized couplers to simplify and speed up cable interchanging. Easy-to-move skid house means flexible power system.

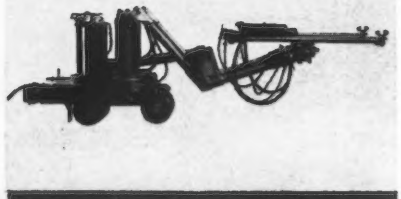
5 INCREASE DRILL FOOTAGE. Self-contained churn drill, powered by G.E., provides rapid rock penetration, promotes effective drilling, blasting practices.

NEW Thor MINING

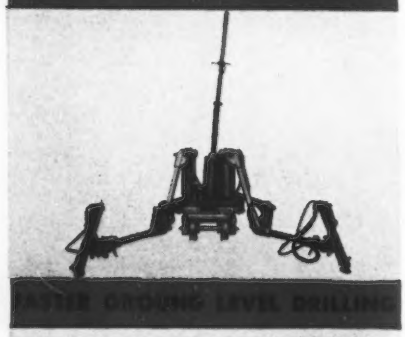
FOR FAST LOW-COST DRILLING IN YOUR MINE...SPECIFY THOR



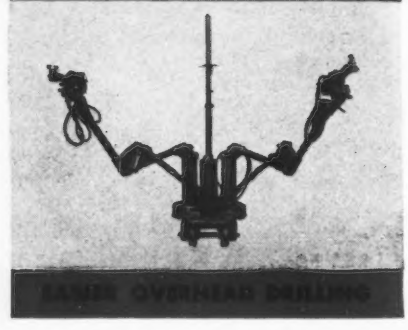
THOR SINGLE BOOM JUMBO



THOR DOUBLE BOOM JUMBO



FASTER ON-GROUND LEVEL DRILLING



SAFER OVERHEAD DRILLING

- ✓ **COMPLETELY OPERATED BY AIR**—No hydraulics.
- ✓ **EASIEST TO SET UP**—Elimination of many time-consuming operations such as blocking, use of extension rods and constant adjustment of the jack provides faster, easier set-ups.
- ✓ **EASIEST TO OPERATE**—Horizontal swing of the boom is automatically locked by air pressure . . . and may be controlled by the operator without leaving his drilling position.
- ✓ **DRILLS ROUNDS FASTER**—When air pressure is released from the boom column . . . very little effort is required to swing the boom to a new position. Apply the air pressure and drill a new hole.
- ✓ **QUICK STEEL CHANGES**—New Thor Power Feed Drifter Mountings, with rapid advance, rapid return and full power feeding at all speeds assure fast efficient drilling, faster steel changes, fewer stuck steels, and reduces total man-hours of labor per hole drilled.
- ✓ **LOW MAINTENANCE COSTS**—Hollow boom carries all supply and control pipes, protecting them from injury. Air motor may be removed without disturbing the boom. Boom actuating screw is hermetically sealed to prevent the loss of lubricant and avoid abrasive damage by foreign matter.

New Thor Jumbo easily disassembles to 3 parts facilitating handling in mine cages.

Illustrated is Two-Boom style . . . One-Boom and Special Models available, details on request.

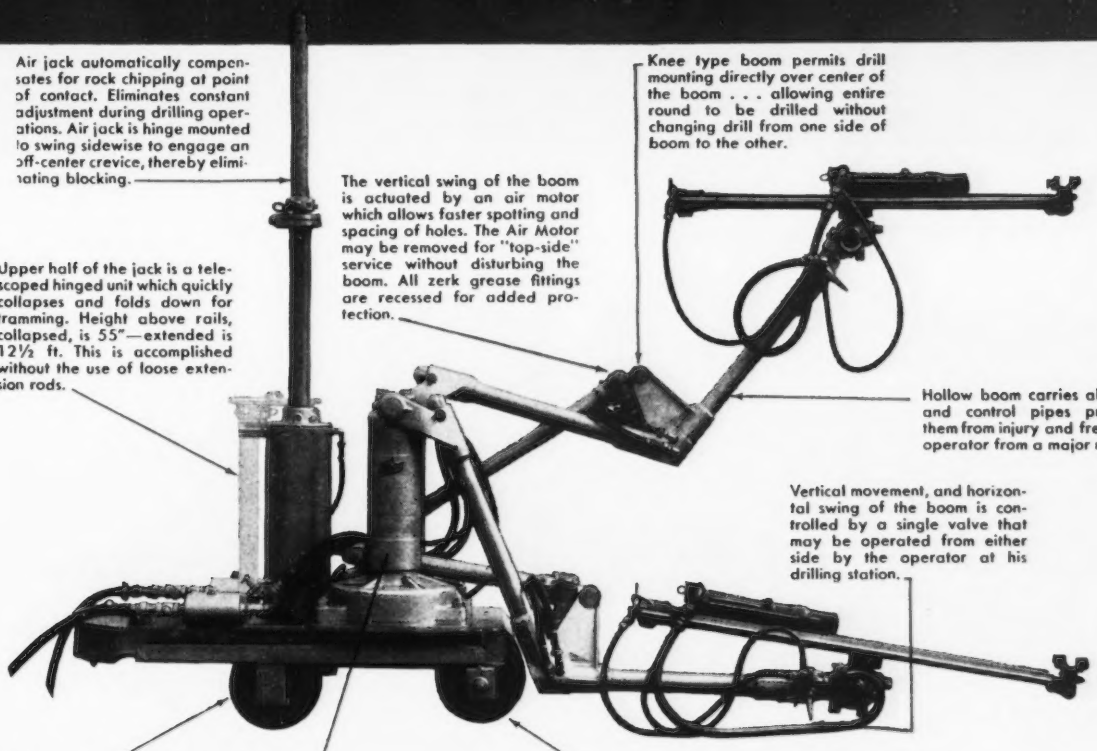
SPECIFICATIONS

	1 Boom DB-100	2 Boom DB-200
Size of Chassis	18" x 35" x 80"	18" x 35" x 80"
Wheel Base	36"	36"
Track Gauges	18"	18"
Size Heading Recommended	8' Wide x 10' High	12' Wide x 10' High
Weight Bare	3600 lbs.	6000 lbs.
Crated For Domestic	3700 lbs.	6100 lbs.
Boxed For Export	4000 lbs.	6400 lbs.
Air Lines	1" Hose	1" Hose (Double)
Water Line	½" Hose	½" Hose (Double)
Boom Column Complete: Bare	1530 lbs.	
Crated For Domestic	1650 lbs.	
Boxed For Export	1750 lbs.	

NOW IN PRODUCTION

JUMBO

DESIGNED BY THOR ENGINEERS IN CLOSE COLLABORATION WITH ENGINEERS OF THE MINING INDUSTRY



Air jack automatically compensates for rock chipping at point of contact. Eliminates constant adjustment during drilling operations. Air jack is hinge mounted to swing sidewise to engage an off-center crevice, thereby eliminating blocking.

Knee type boom permits drill mounting directly over center of the boom . . . allowing entire round to be drilled without changing drill from one side of boom to the other.

The vertical swing of the boom is actuated by an air motor which allows faster spotting and spacing of holes. The Air Motor may be removed for "top-side" service without disturbing the boom. All zerk grease fittings are recessed for added protection.

Upper half of the jack is a telescoped hinged unit which quickly collapses and folds down for tramming. Height above rails, collapsed, is 55"—extended is 12½ ft. This is accomplished without the use of loose extension rods.

Hollow boom carries all supply and control pipes protecting them from injury and freeing the operator from a major nuisance.

Vertical movement, and horizontal swing of the boom is controlled by a single valve that may be operated from either side by the operator at his drilling station.

Rear wheels are spring mounted allowing car body to set on the track when the air jack exerts pressure on the ceiling or back . . . This feature makes the car a rigid platform for the operation of the drill—eliminates time consuming clamping and blocking operations.

Boom column air piston under pressure automatically locks the horizontal swing of the boom preventing boom drift and binding during drilling operations. When air pressure is exhausted boom will swing with very little effort.

Large 14" wheels mounted on Timken Bearings for easy rolling. Wheel treads are 3½" wide to compensate for variable gauge track. Practically eliminates de-railing difficulties.

FIELD-TESTED FOR 3 YEARS

THIS new Thor engineered Jumbo with simplified operating controls, is packed full of new design features . . . features that will speed your drilling operations. You can set up . . . drill a round . . . and remove this Thor Jumbo from the face in less time and with less effort than any other similar machine on the market today. Write for additional information on how this new Thor Jumbo will speed your mining operations . . . or, if you request we will send a Thor Mining Engineer to give you personal on-the-job assistance. Write Thor Power Tool Company, Aurora, Illinois.

Thor

THOR POWER TOOL COMPANY

AURORA, ILLINOIS

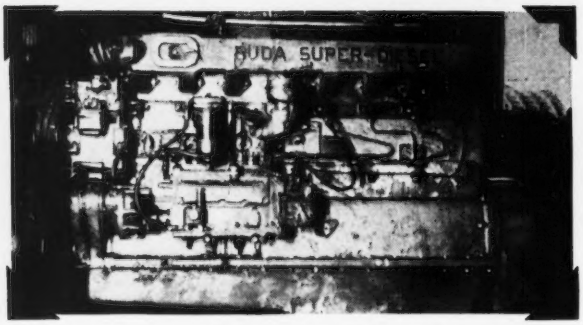
EXPORT DIVISION 330 W 42nd STREET, NEW YORK 36, NEW YORK

THE ENGINEER'S REPORT

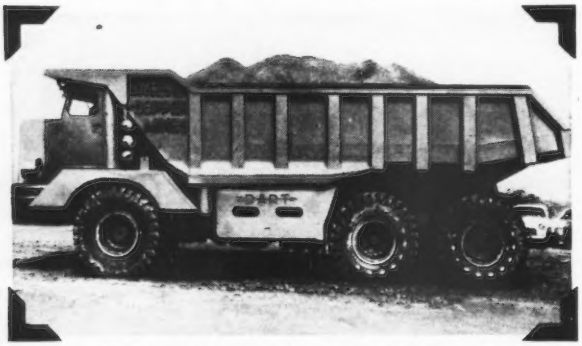
DATA

LUBRICANT	RPM Delo Oils
UNITS	21 Buda diesel engines
OPERATION	Hauling ore
CONDITIONS	Heavy duty — 8-15% grades
PERIOD	6 years
FIRM	Bagdad Copper Corp., Bagdad, Arizona

No stuck rings in 21 engines in 6 years hauling ore!

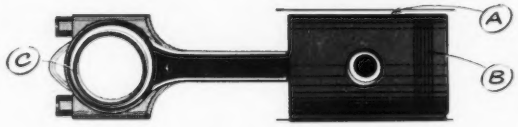


HAULING 22-TON LOADS up 8 to 15% grades out of the Bagdad Copper Corp. open-pit mine, 21 Buda diesels have had no stuck rings, no clogged ring grooves since using RPM DELO Special Lubricating Oil for the last 6 years. Engines operate 2 shifts a day, 6 days a week in heavy abrasive dust. Torn down after 7000 hours, all parts in the engine above were exceptionally clean and all bearings were good.



BIGGEST OFF-HIGHWAY TRUCK IN THE WORLD (above) was recently built for Bagdad Copper Corp. It weighs 96,000 pounds, hauls 75 tons. RPM DELO Special Lubricating Oil was also selected for its two 350 H.P. supercharged Buda diesels because of the excellent service Bagdad has had from this oil.

How RPM DELO Oils keep engines clean and prevent wear



A. Contain special additives that provide metal-adhesion qualities...keep oil on parts whether they are hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean, helps prevent scuffing.

C. Special compounds stop corrosion of any bearing metal, and oil foaming in both wet and dry sump engines.

There is an RPM DELO Oil to meet every heavy-duty engine operating condition.

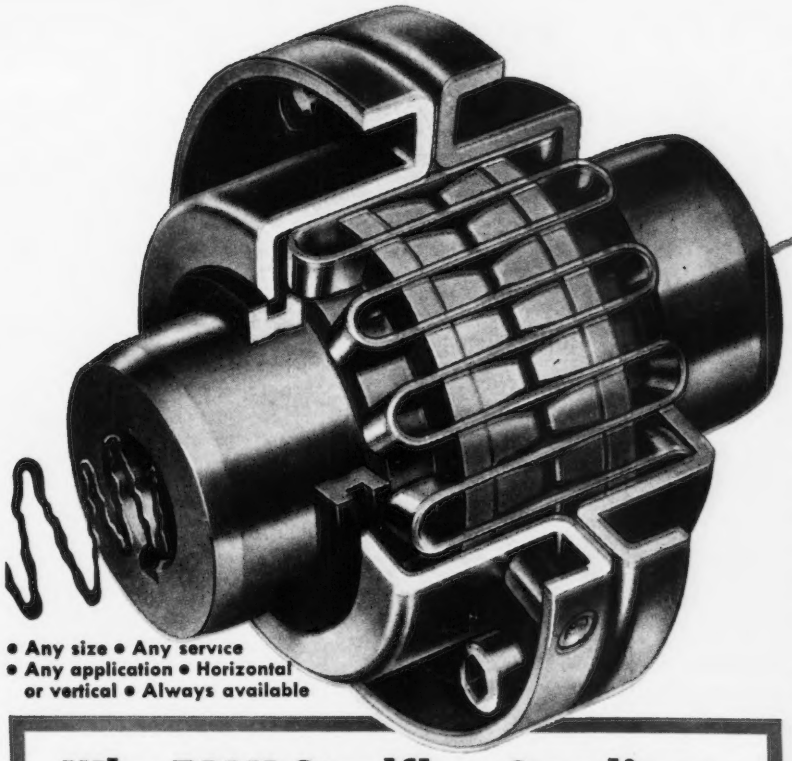
FREE BOOKLET on the RPM DELO Oils gives you complete information. Write or ask for it today.

RPM DELO LUBRICATING OILS

STANDARD TECHNICAL SERVICE checked this product performance. For expert help on lubrication or fuel problems, call your Standard Fuel and Lubricant Engineer or Representative; or write Standard Oil Company of California, 225 Bush St., San Francisco.

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado



• Any size • Any service
• Any application • Horizontal or vertical • Always available

Why FALK Steelflex Couplings give the *finest* protection for connected machinery

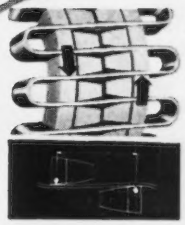
Maximum protection of connected machinery is best provided by Falk Steelflex Couplings because, thanks to their exclusive design, they overcome the damaging conditions of shock loads, shaft misalignment and vibration. How this unique multiple protection is made possible is shown at the right.

Falk Steelflex Couplings give the most economical protection, too, because they make connected machinery last longer and give better service. Furthermore, when actual coupling costs are figured per year of service, Falk Steelflex Couplings show substantial savings through their rugged all-steel construction, easy interchangeability and low maintenance requirements.

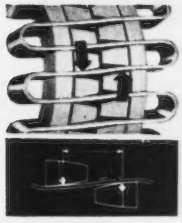
The basic Type F Steelflex Coupling—in 33 sizes to cover capacities from 2/5 through 70,000 hp per 100 rpm—meets over 90% of all industrial applications. Special or Dual Purpose Steelflex Couplings are available for problem applications. Write to Department 247 for engineering bulletin, including selection and dimension details.

Exclusive FALK Steelflex grid-groove design smothers shock and vibration.

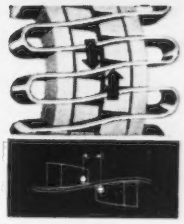
The damaging effects of shock and vibration can shorten the life of any connected machinery. Here is how the Steelflex grid-groove design overcomes these common enemies.



Under LIGHT LOADS
The gridmember bears only at outer edges of grooves. The long span between points of contact remains free to flex under load variations.



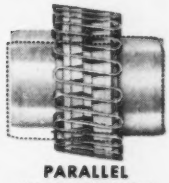
Under NORMAL LOADS
As load increases, the distance between supports on the grooves is shortened proportionately, but a free span remains to cushion shock loads.



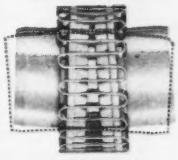
Under SHOCK LOADS
Under extreme overloads, the grid-member bears fully on the grooves and transmits full load directly. The coupling remains flexible, within its rated capacity.

...Accommodates shaft misalignment and free end float

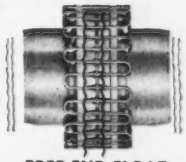
Basic maintenance procedure dictates regular inspection and correction of shaft alignment. Between inspections, Steelflex couplings provide protection by accommodating unavoidable shaft misalignment and end float. The gridmember which connects the two hubs of a Steelflex coupling is not fastened to either hub, so each hub can shift without imposing load on the other shaft.



PARALLEL MISALIGNMENT



ANGULAR MISALIGNMENT



FREE END FLOAT

THE FALK CORPORATION, Milwaukee 8, Wisconsin

MANUFACTURERS OF

- Motoreducers
- Speed Reducers
- Flexible Couplings
- Shaft Mounted Drives
- High Speed Drives
- Special Gear Drives
- Single Helical Gears
- Herringbone Gears
- Marine Drives
- Steel Castings
- Weldments
- Contract Machining

FALK

...a good name in industry

Help for Mine Operators on the cost sheet... and on the job

In the past 15 to 20 years, the mining industry has kept stripping and output costs down in spite of rising labor and material costs. To do it, mine operators have pioneered new earth-moving techniques that have put constantly increasing demands on machinery. That's why in today's tough competitive era, mining requires modern, versatile equipment that enables the mine operator to increase output per man-hour and work at a profit.

In an effort to cooperate fully to meet these demands, Allis-Chalmers has for years geared its progress to that of the mine operator himself... now offers him completely new designs like the HD-15... a machine that takes advantage of even the most recent developments in tractor application.

The design of the HD-15 also makes full use of new metals, new oils and greases, and the latest manufacturing processes. Existing models were not allowed to restrict Allis-Chalmers engineers . . . so they worked right from the ground up, matching part to part, assembly to assembly, and the entire tractor to its Allied equipment. As a result, the HD-15 offers new standards in ease of operation and service, as well as long-life performance. With outstanding balance characteristics, it handles both mounted and drawn equipment well, provides maximum flexibility for the wide variety of jobs.

We invite you to talk with your nearby Allis-Chalmers dealer to compare values . . . see for yourself how the HD-15 can be a big factor in helping you to increase output per man and hold costs in line.

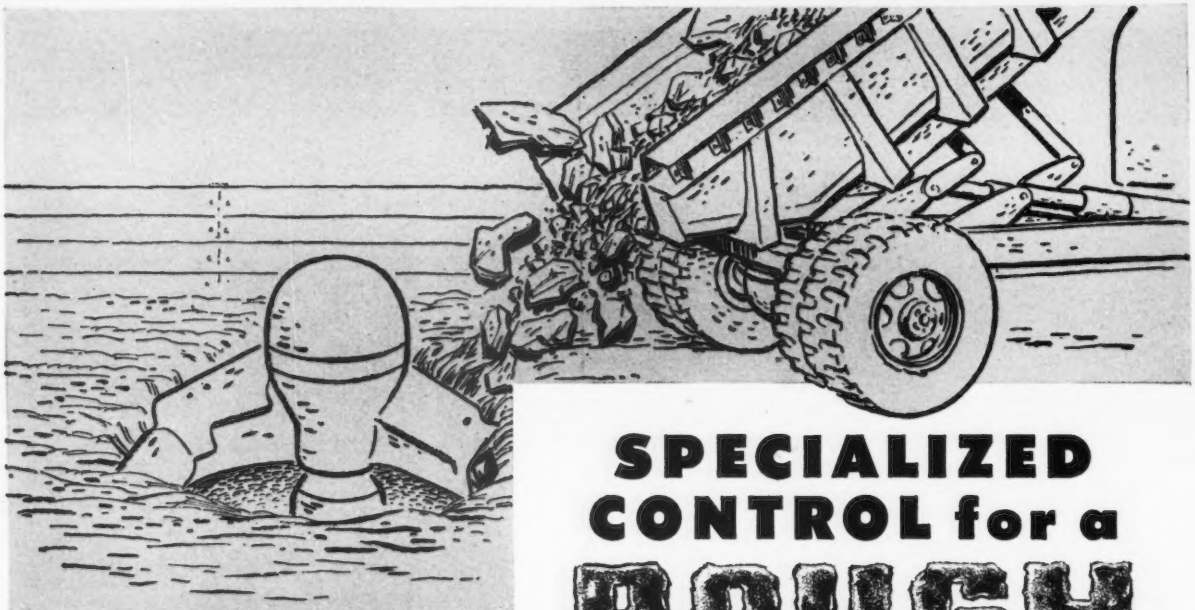
ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

HD-15
109 drawbar hp.
27,850 lb.
Six speeds forward to 5.8 mph.
Three reverse speeds to 4.5 mph.

Constant progress in earth-moving methods has been matched by such design advances as this HD-15 and its engine-mounted dozer . . . which were engineered and tested as a unit, right from the start.

This HD-15 Tractor Shovel is a tool which introduced a new era of tractor usefulness. This versatile machine moves from job to job easily and does traditional jobs in a better, faster way.

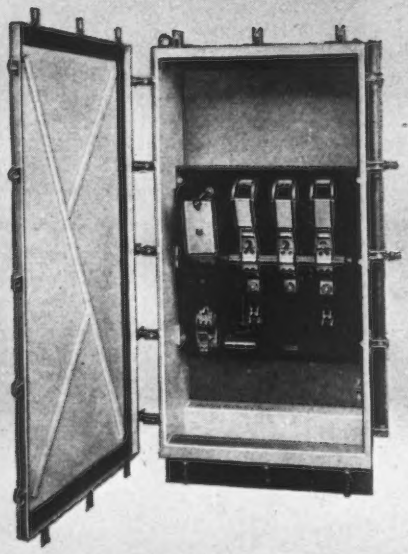
The improvements and refinements of really modern design take on new significance as demands on machinery grow. Extra yardage handled . . . or lubrication time saved means working more efficiently, more profitably.



SPECIALIZED CONTROL for a ROUGH TOUGH JOB

ALLIS-CHALMERS

CONTROL



400-horsepower, 440-volt controller for squirrel-cage motor or primary of wound-rotor motor. Dust-tight enclosure.

Custom-Engineered Protection for Motors Driving Crushers

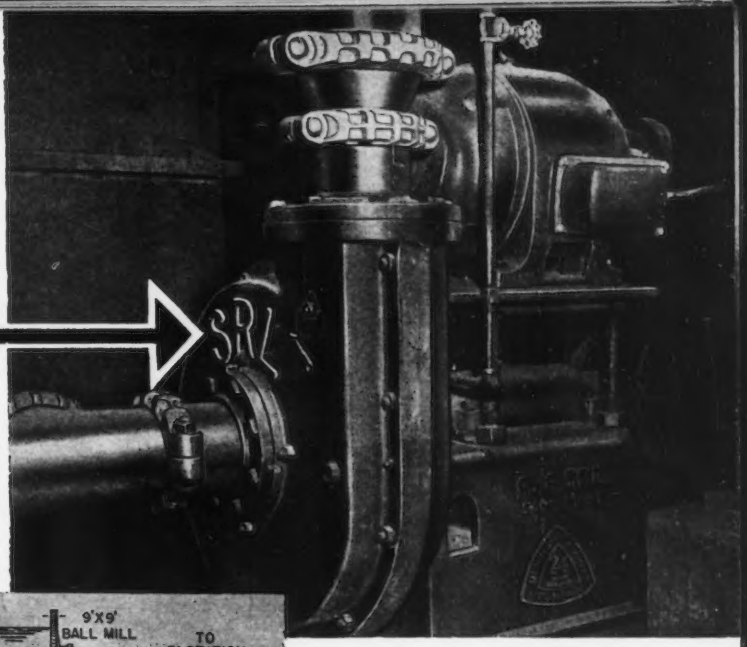
PROTECTING A MOTOR driving an ore or rock crusher is a particularly complex control problem. In crushing, motor burdens (resulting from high inertias or extreme fluctuation of loads) dictate protection far beyond that provided by standard controllers. Only control engineered for your specific job can provide adequate protection.

An Allis-Chalmers control application starts with expert analysis of your problem by an A-C representative. Type of crusher, specific crushing conditions, and cost weighed against lost production are all factors in determining the kind and degree of protection he will specify. All recommendations are backed by complete research and testing facilities . . . by unsurpassed skill and experience in design, manufacture and application. For complete information, call your nearby A-C representative or write for Bulletin C53-424, Allis-Chalmers, Milwaukee 1, Wis.

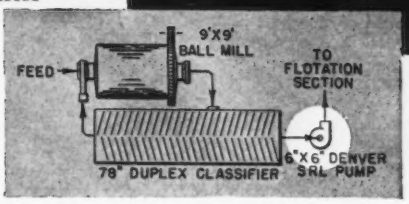
A-4306

ALLIS-CHALMERS

DENVER SRL PUMPS AT Climax



Here's why Climax Molybdenum Company has 44 Denver SRL Sand Pumps in it's modern, efficient mill



A 6"x6" Denver SRL Sand Pump operating at 690 r.p.m., handling 2200 tons per 24 hours of —28 mesh classifier overflow material at 45% solids. Life of pump runner and casing liner was 593,000 tons.

BACKGROUND

Originally, a 2"x2" Denver SRL (Rubber Lined) Sand Pump was installed on a trial basis at Climax to handle coarse, abrasive —28 mesh deslimed pyrite flotation concentrates. Later, Climax purchased one 6"x6" Denver SRL Pump to handle the problem described with the photo above.

RESULT

Operation of these original Denver SRL pumps was so successful that, as a direct result, 42 additional Denver SRL Sand Pumps have been installed in this outstanding mill. These new pumps vary in size from the 2"x2" SRL (Open Runner) to the 8"x6" SRL-C (Closed Runner).

REASON

The Climax operators have found the efficient, trouble-free operation of Denver SRL Pumps entirely satisfactory. Life of wearing parts is long and shut-down time minimized. Horsepower requirements have been low and high efficiencies have resulted. Obviously, the Denver SRL is a big success at Climax.

HOW DENVER SRL PUMPS CAN REDUCE YOUR PUMPING COSTS

Send full data to us today regarding your particular pumping problem. Experienced DECO engineers will evaluate your problem and will return correct and workable recommendations immediately. This will obligate you in no way.

We carry replacement parts for all sizes of Denver SRL Sand Pumps in our Denver stocks. This enables us to give you prompt service whenever you may need it.

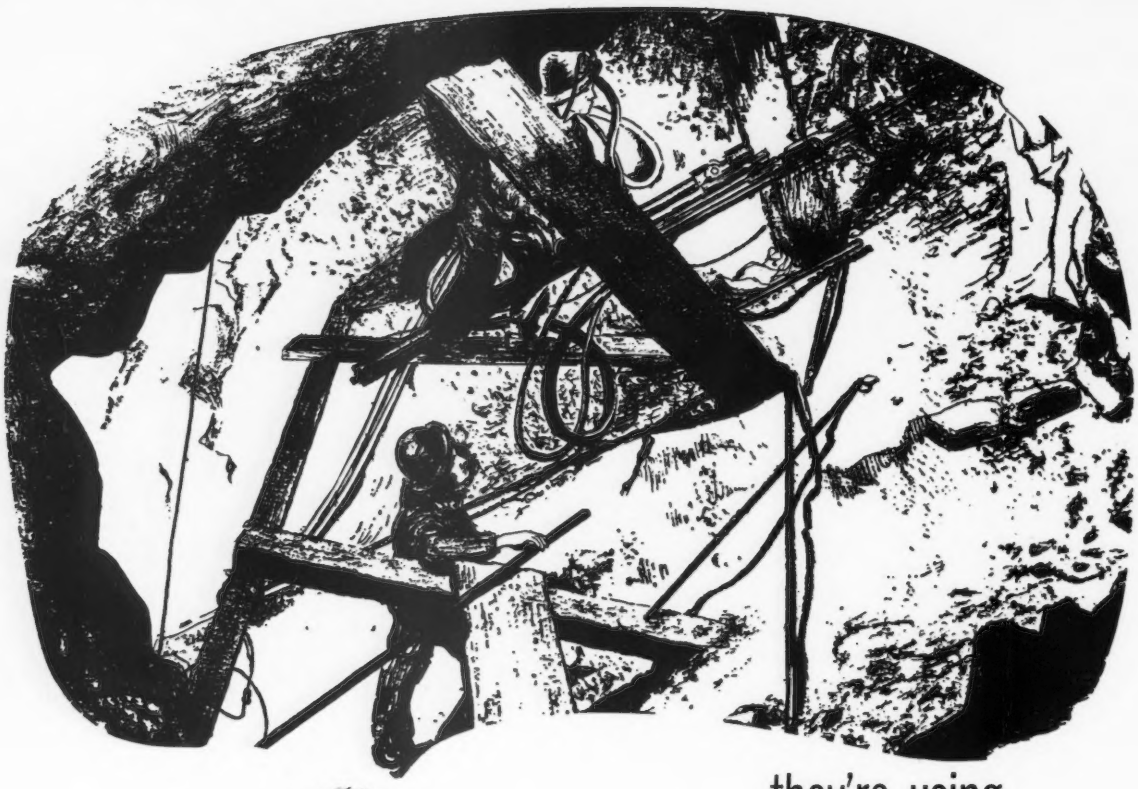
WRITE FOR FREE BULLETIN

DECO FLOTATION ENGINEERS — DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

"The firm that makes its friends happier, healthier and wealthier"

DENVER, NEW YORK, CHICAGO, EL PASO, SALT LAKE CITY, VANCOUVER, TORONTO, MEXICO, D.F., LONDON, JOHANNESBURG

DENVER EQUIPMENT CO., 1400 Seventeenth St., Denver 17, Colorado



they're using CRUCIBLE HOLLOW DRILL RODS at Climax

High on Colorado's continental divide, the Climax Molybdenum Company is working the largest underground mine in the United States.

As an example of the size of this operation, just one cavity — the "Glory Hole" — was made by the removal of 70 million tons of ore. And regular production will soon be at the rate of 28,000 tons of ore per day.

It's a job that demands skillful mining technique... and the best of equipment. That's why Crucible Hollow Drill Rods are extensively used. For they are produced to *tool steel standards* by the leading producer of tool and special purpose steels. To you, this means dependability — fewer broken rods and lost bits. So for *lowest cost per foot of hole drilled* specify Crucible Hollow Drill Rods.

Visit us at Booth 600
American Mining Congress Show
San Francisco, California
September 20-23

CRUCIBLE first name in special purpose steels

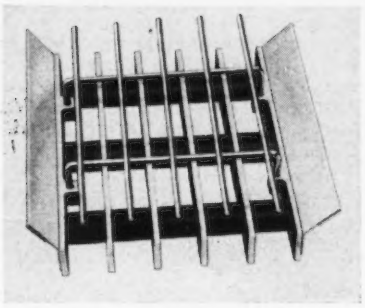
54 years of Fine steelmaking **HOLLOW DRILL ROD**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • MAX-EL • ALLOY • SPECIAL PURPOSE STEELS

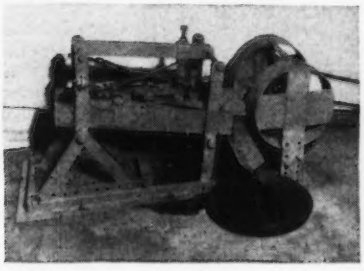
Canadian Distributor — Railway & Power Engineering Corp., Ltd.

E&MJ NEW PRODUCTS DIGEST



GRATE SEPARATOR

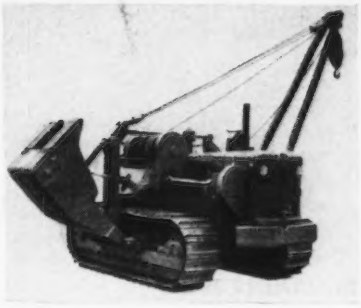
Designed to be placed in hopper throats or floor openings, magnetic grates, made by Homer Mfg. Co., Lima, Ohio, are said to trap even the smallest and most elusive tramp iron particles, keeping them out of expensive machinery or causing product contamination. Consists of a wire grid with horizontal rods placed between highly saturated Alnico No. 6 magnetized bars. Horizontal rods deflect free flowing material into streams which wipe the magnetized bars. There is little chance for the smallest particle of iron or steel to escape. Sizes from 2x4 in. up to 6 or 8 ft square. **(1)**



FINE GRINDING MILL

A new type of fine-grinding mill has been developed by James L. Brickley, Spokane inventor. Brickley claims his mill is less expensive to install and operate than the conventional ball and rod mill, and that it virtually eliminates the "greasing" of ore. The mill's dimensions are 10 ft x 20 in. x 36 in., and it uses a 3 or 4 hp motor. The mill consists of a stationary inclined floor with a vibrating upper section. Ore, ½ to ¾ in., feeds from the crushing plant into a hopper at the mill's top. It drops them into a feeding device, a vibrating rubber apron. Ore shakes into the stationary inclined section and is hammered several hundred times a minute by parallel cutting bars. Fineness can be adjusted by regulating the angle of the floor section and the water flow.

Three mills are now in use, manufactured by Edgecliff Machine & Welding Works, Spokane, Wash. **(2)**

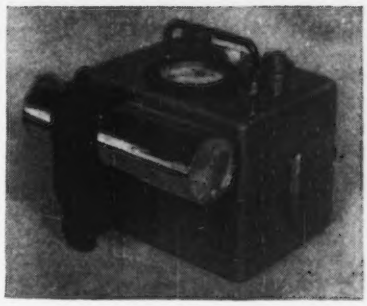


SIDE BOOM

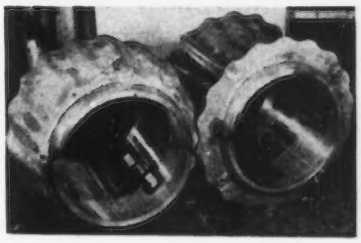
Side boom for a crawler tractor with a 38,000-lb lifting capacity at 4 ft overhang is announced by Tractomotive Corp., Deerfield, Ill. It is the Model TSB-9 for the Allis-Chalmers HD-9F Tractor, 72 drawbar horsepower. The front-mounted power take-off means the power is taken from a live shaft so that the side boom works independently of the tractor master clutch. Further, the front power take-off leaves the back of the tractor free for installation of a winch or other rear-mounted equipment often required in this size machine. The TSB-9 also has a twin clutch arrangement on the power take-off. **(3)**

SCINTISCOPE

Scintiscope, Model CAX37P, portable scintillation counting survey meter, applicable to an extremely wide range of activity levels. The operator can choose from eight range settings, giving full-scale readings from .05 mr/hr to 500 r/hr. Two sub-assemblies, pistol-grip probe and battery case, are connected by a 7-ft retractable cable. Panel controls and large, sensitive, shock-proof meter are mounted on the battery case, which can be carried over the user's lower



chest by belt and shoulder straps. Shock-proof and watertight design make the instrument suitable for field use. Probe can be locked to battery case by a four-position indexing attachment, which makes available several standardized arrangements for calibrating, assay work and for monitoring. Standard probe is designed for gamma detection. Snap-on Phosphors for alpha, beta or neutron counting are available. R-C Scientific Instrument Co., Inc., Playa del Rey, Calif. **(4)**



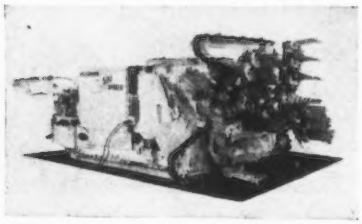
CRUSHER

The heart of this crusher is a pair of rotors, one concave and the other convex, each of which is corrugated axially, the corrugations being constantly spaced around the entire peripheral surface. These rotors move in opposite directions, are independently driven, and are accurately timed, so that the corrugations are in constant mesh, thus preventing slippage and virtually eliminating flat or elongated particles. Result of this construction is that rock is forced through the rotors at their peripheral speed, thus increasing the capacity of the crusher over that of crushers depending upon

gravity flow. Space between rotors can be varied between 3.8 and 6 in. The Latture Roto-Crusher, manufactured by Waldrip Engineering Co., Hollydale, Calif., is said to be producing minus ¾ in. material at the rate of 140 tons per hour, with an approximate reduction of 4 to 1. **(5)**

MOBILE DRILL

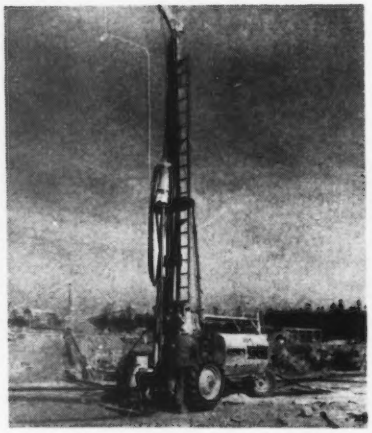
Compact mobile drill, the "Holemaster," capable of drilling blast holes to 400 ft in diameters from 4¼ in. to 6¼ in., is offered by George E. Failing Co., Enid, Okla. Chain feed mechanism is controlled by a single lever mast, 31½ ft long for hand 20-ft drill pipe, is raised and lowered hydraulicly. Le Roi air compressor on unit has maximum rated capacity of 450 dfm at 50 psi. **(6)**



CONTINUOUS MINING MACHINE

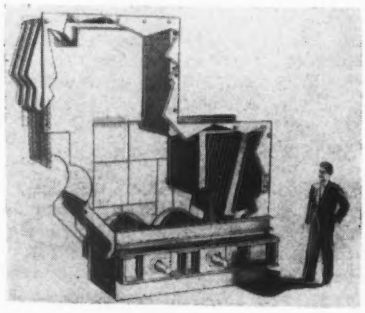
Mining men working in softer formations may well be interested in a new continuous type mining machine introduced by the Goodman Manufacturing Co., Chicago, Ill. It is a mining and loading machine of the boring type, capable of producing up to 7 tons of coal per minute from the solid, unprepared seam. Known as the Type 500 Miner, the machine has a fixed cutting height of 7 ft. It feeds into the seam by traction of its treads, cutting and breaking out coal with twin rotating units and a cutter chain. As it advances, the dislodged coal is pushed to the center of the path by the rotating units and bull-dozed onto the machine's chain conveyor. Crosscuts can be turned at 90 deg angles by maneuvering on independently controlled, reversible treads and utilizing a full 80 deg side swing of the tail section of the rear conveyor. Seam irregularities can be followed by means of tilting the cutting units forward, backward or to either side. The wide, oval path cut by the machine measures 7 ft high by 13 ft 2 in. wide, at its centers. It is arched on both sides and at the top corners for strong roof support. The bottom is cut out at each side and completely cleaned for a wide, flat roadway.

A 100-hp motor drives the cutting units, a 50-hp motor powers the hydraulic system that controls all other machine movements. **(7)**



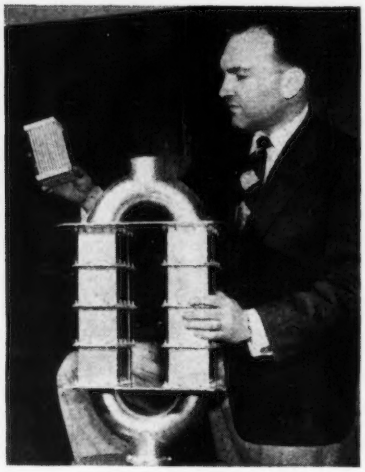
BLASTHOLE DRILL

The largest hammer drill yet designed is the "heart" of the Joy Challenger blasthole drill, built by Joy Manufacturing Co., Pittsburgh, Pa. The Challenger will drill 4½-in. dia holes to depths of 50 ft or more in any type of formation, including hard igneous or metamorphic rocks. A 5¼-in. hammer-type drill, mounted on a 26-ft feed to give 20-ft steel changes, furnishes ample drilling power. The Challenger is available with a choice of three different mountings. **(8)**



IMPACT BREAKER

Called the Kennedy "Cuber Senior," the unit is a dual rotor, up-running impact breaker featuring a multi-stage, triple action reduction principle for both primary and secondary breaking of non-abrasive stone and like material in a single unit. It is designed for both stationary and portable use in open or closed circuit operation. In a split second after material enters, while it is still falling, it encounters the rigidly mounted hammers of the first rotor in a head-on impact. Two massive rotors with integral hammers provide the entire rock breaking action, making it unnecessary to mount supplemental impact members close to the periphery of the hammers. The unit will handle any rock freely passing the 36x48-in. feed opening and, in many types of rock, can be operated in a closed circuit to produce 100% passing 1 in. Maximum capacities of the model 3648 in average limestone are listed as up to 350 tons per hour of minus 3 in. up to 275 tons minus 2 in. and up to 150 tons minus 1 in. with 150 to 250 hp required. Kennedy-Van Saun Manufacturing & Engineering Corp., Danville, Pa. **(9)**



DIESEL DE-ODORIZER

The Dieseler—a new remedy for diesel engine exhaust fumes—is shown here with one of the catalytic units (Oxycats) that are the heart of the exhaust system. This twin-flow, heavy-gage steel catalytic muffler containing eight catalytic units is one of several models now being made by Oxy-Catalyst, Inc. The unburned carbon monoxide and hydrocarbon fumes of the engine exhaust flow across the catalyst-coated rods of the Oxycats where there are converted by catalytic oxidation to carbon dioxide and water vapor. **(10)**

DRILL BIT

A newly developed, less expensive alloy steel, especially suited for use in cable tool drill bits, is now being used by the Sanderson Cyclone Drill Co., Orrville, Ohio, in their Superloy alloy bits. **(11)**

HARD-SURFACE BY PAINT BRUSH

An entirely new kind of "metal-cladding" which can be supplied by anyone

SYMONS VIBRATING ROD GRIZZLIES for heavy duty big capacity scalping from ½" up to about 4".

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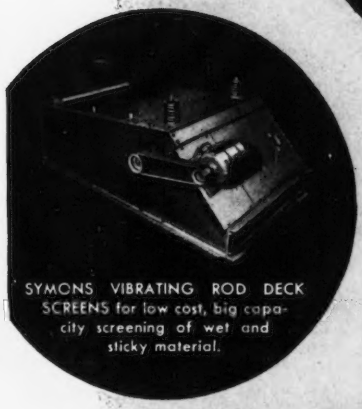

SYMONS VIBRATING ROD DECK SCREENS for low cost, big capacity screening of wet and sticky material.

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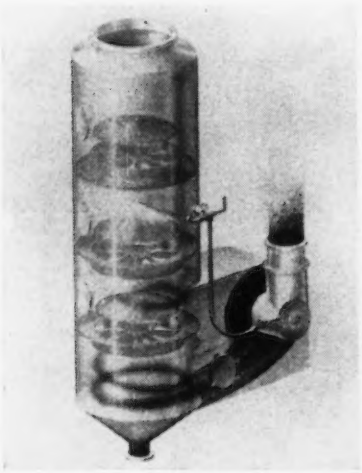
ALLIS-CHALMERS

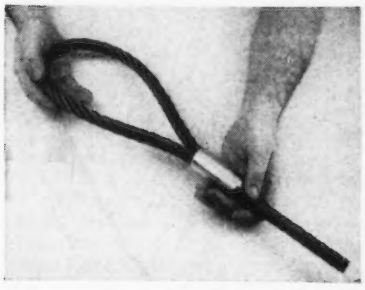
A-C ALLIS-CHALMERS

to any surface at room temperature, which not only imparts to the chosen substrata a hardness and abrasion-resistance almost equal to metallic tungsten, but is self-lubricating as well, has just been announced by Lockrey Co., Southampton, New York, under the trade name of "Tungstide." **(12)**



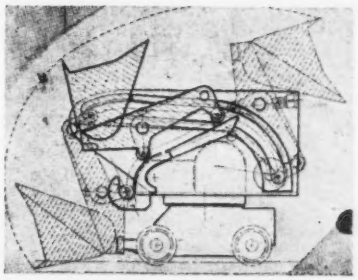
DUST COLLECTOR

Centrifugal wash collectors, described as "package" units, combining exhauster and precipitator components, have handled such difficult dusts as carbon black, limestone, pigments and glazing particles with efficiencies of over 99% by weight. A technical brochure on the Ducon UW-3 Wash Collector describes, with text, pictures and charts, the principles of its unique two-phase system. Ducon Co., Mineola, New York. **(13)**



WIRE ROPE SPLICER

Huge savings in time are made possible by a new wire rope pressing system that eliminates hand splicing. Using the new system, a worker can make as many as 20 or 30 splices in an hour, compared to 6 or 7 conventional splices. The pressing system employs an aluminum alloy clamp or sleeve that is squeezed around the wire rope in a special 300-ton hydraulic press. Called JalKlamp, the device is used as a mechanical method of splicing eyes, with or without thimbles, in the ends of wire rope. This "splice" gives 100% of the breaking strength of the wire rope itself. Jones & Laughlin Steel Corp., Pittsburgh, Pa. **(14)**



SHOVEL LOADER

Patented feature of this mechanical shovel loader for mucking development drifts is the smooth movement of the shovel arm, accomplished on four hardened steel rollers operating in carefully designed camguides. Bucket is loaded by driving machine against muckpile. Drawing shows path of bucket as hoist retrieves it. J. Brockhouse, Johannesburg, South Africa. **(15)**

SELF-PROPELLED SERVICE STATION

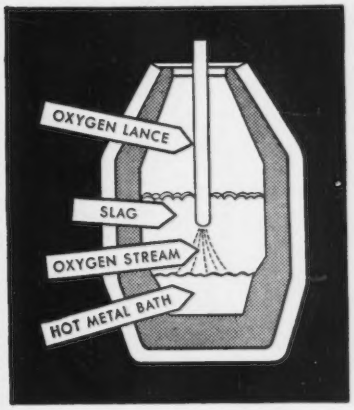
Prime-Mover Co., Muscatine, Ia., has introduced a small self-powered, self-propelled service station for maintenance of heavy equipment. Powered by a 6 hp Wisconsin engine, the entire unit, including compressor, air tank, space for three 100-lb drums, tool trays, service hoses, and lubricant pumps is only 31 in. wide. The unit travels over rough ground and up steep slopes and can be run up planks into a truck for long hauls. **(16)**

AIRBORNE RADIATION EQUIPMENT

Greater sensitivity, cancellation of cosmic radiation and greater resolution resulting in safer survey altitudes and improved area coverage are claimed for the model AEP1903R aerial survey instrument by Measurement Engineering Ltd., Arnprior, Ontario, Canada. In addition, a unique circuit is incorporated which

what's NEW in Engineering

To cut refining costs of steel, Kaiser Engineers has acquired the exclusive U. S. rights for the Brassert Oxygen Converter Process of producing high quality steel. Recognized as an advanced development



in steelmaking, the oxygen process promises a definite saving in refining costs of at least $3.00 per ton. Investment cost is also lower, as one 35-ton oxygen converter will produce as much as three 175-ton open hearth furnaces at half the estimated capital investment. Write us for a brochure describing the process in detail.

The largest construction contract in Australia's history has been awarded to the Kaiser-Walsh-Perini-Raymond group of American contractors. With Kaiser Engineers as the project's sponsor, the group will construct a dam and mammoth 14-mile water tunnel through the Snowy Mountains of Southeast Australia.

Asme Handbook Metals Properties. This is Volume I of a four volume handbook sponsored by The Metals Engineering Handbook Board of the American Society of Mechanical Engineers. Published by McGraw-Hill, METAL PROPERTIES tabulates strength, hardness and the other properties of over 500 metals.

Whatever your immediate research, design or engineering problems, however unusual they may be, an early consultation with Kaiser Engineers is an important step toward their quick, profitable solution. Call or write Kaiser Engineers Division of Henry J. Kaiser Company, Kaiser Building, Oakland 12, California.

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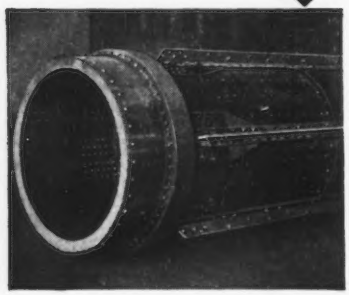

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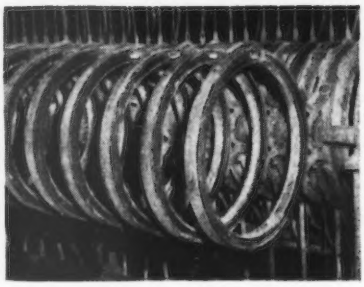
essentially eliminates random statistical fluctuations for easier chart interpretation. **(17)**

RECIPROCATING CONVEYOR

Reciprocating conveyor designed to feed a constant volume of any dry or moist material from an overhead bin is announced by the Hydro-Blast Corp., Chicago, Ill. Operation is not affected by lumps or variations in the consistency of the material. Units of various capacities are easily adjustable from maximum capacity to zero. Operated by plant air, the only electric power required is to operate a solenoid air valve. **(18)**



MECHANIZED PLATE AND FRAME FILTER

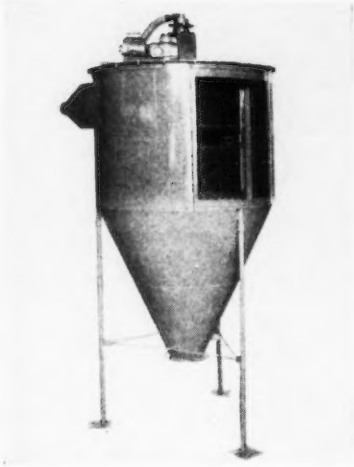
Plate and frame filters have been giving way to vacuum filters—primarily because conventional plate and frame operations require a high proportion of hand labor. But the entirely new Eimco-Burwell plate and frame filter, made by Eimco Corp., Salt Lake City, Utah, has overcome this disadvantage. In a typical 35-minute cycle, only 5-6 minutes would be devoted to dumping; two men can keep three 30-frame Eimco-Burwells in continuous operation.

Key to success of the new design lies in the mounting of paired frames at an angle of 180 deg on a central shaft. Thus one frame can be rotated out of the filtration line while a clean one goes in —permitting leisurely access for maintenance of individual cloths or frames while the filter remains in operation. Ease of maintenance and simplified construction suggest a marked lifetime advantage over other wood and stainless steel filters.

The Eimco-Burwell also claims a high wash efficiency. On a feed liquor containing about 100 grams of soluble tungsten values per liter, the cake is washed to a point where the soluble content of the tailings is less than 0.03%. This represents a wash efficiency of over 99%, is accomplished with less than one pound of water per pound of solids. High wash efficiency results from the fact that the feed prevents segregation of coarse and fine particles. Lack of segregation in turn results in a uniformly distributed cake, making possible uniform passage of wash water. **(19)**

AIR HOSE

Flexsteel air hose is designed to combat abusive external conditions found generally in the mining industry. A mandrel-made hose, it has a heat and oil resistant tube, impact and abrasion resistant cover, soft tan in color; and is reinforced with steel wire. Goodyear Tire & Rubber Co., Akron, Ohio. **(20)**



DUST COLLECTOR

Designed on a new rotary arm cleaning principle, the Model R Aeroturn dust collector incorporates principles of reverse-air-jet filtering. Because of its cylindrical housing and continuous cleaning action, it can handle extra heavy dust loads without overloading. This design feature now makes economically possible dust collecting in pneumatic conveying systems operating under high pressure-vacuum conditions. Turner & Haws Engineering Co., Boston, Mass. **(21)**

DESURGER

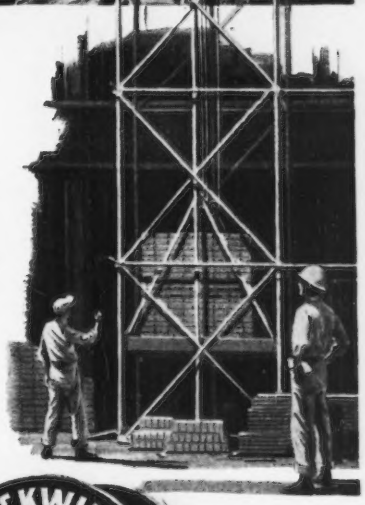
Desurger is a through-flow, in line, dual-acting pulsation dampened, for installation in any fluid piping system. It is designed to allow fluid flow with accumulation and discharge of excess pressures through throttling orifices of a calculated number and size, so that these pressure surges are broken up and dissipated. **(22)**

MUSCLES OF STEEL
took the load off his back

Sweat and a strong back just aren't enough when it comes to meeting the stepped-up demands of modern construction work. Today's contractors and builders call on *muscles of steel*—sturdy wire rope—to lift and carry their heavy loads.

Supplying these *muscles of steel* to the giant that is American industry is our big job here at Wickwire—a job that has commanded our vigilant care and painstaking quality control for over half a century.

In the mines and the quarries. In the logging camps and the oil fields. On construction and highway projects. With the fishing fleets and in materials handling. Wherever wire rope is used, Wickwire Rope has earned an outstanding reputation for efficiency, utmost safety, long economical service and unfailing reliability.



every industry benefits from wire rope

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THE COLORADO FUEL AND IRON CORPORATION

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"We get the best performance from CAT* Engines"

That's what Fred McLane, vice president of S. E. Evans Construction Co. of Ft. Smith, Ark., says. He adds, "We plan to buy principally Cat equipment in the future." The company has three construction units, for the most part Caterpillar-equipped. Working in the iron ore fields near Linden, Texas, this excavator loads 70,000 tons of crude ore producing 20,000 short tons per month of concentrates ranging from 46 to 47% iron. The crude ore is taken from a virtually unlimited supply.

The performance of the Caterpillar D386 Engine in this Manitowoc model 4500 dragline is one reason for the company's satisfaction with Caterpillar equipment. The husky 400-HP diesel replaced *two* engines of another make. "We now have plenty of power," says operator J. T. Hall. And it's steady, reliable power. The big rig, with 83-foot boom, loads 250 wagons a day, filling each one with three passes of its bucket.

In its first 1900 hours of operation, the rugged Caterpillar D386 has needed no repairs. S. E. Evans Construction Co. expects many more thousands of hours of dependable, economical work life, thanks to such Caterpillar features as specially hardened crankshaft journals, long-lived aluminum alloy bearings, and efficient filters and seals. Important in cutting costs is the ability of every Cat Diesel to deliver full and *foul-free* power on inexpensive No. 2 furnace oil.

There are 12 sizes of Caterpillar Engines and Electric Sets, to 500 HP and 315 KW. Leading manufacturers can supply Caterpillar power in their excavators and other mining machinery. And you can get replacement power from your Caterpillar Dealer—who will help you cut costly down time to a minimum with fast, skilled service and genuine, high-quality parts. Ask him today to help you select the rugged yellow engine that will do the most work for *you* at the lowest cost.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

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For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

WIRE ROPES. A useful booklet entitled "Terminal Splicing of Wire Ropes" is available from British Ropes Limited, Doncaster, England, for demonstrations of the 5-tuck splice 17x7 multiple stranded rope, 34x7 multiple stranded rope and the Bordeaux connection. **(71)**

AIR HYDRAULIC MAINTENANCE. A pocket-size manual entitled "The ABC's On Maintenance of Air and Hydraulic Equipment" deals with its subject in cartoon style to bring to the reader a practical explanation of the "rights" and "wrongs" in setting up and servicing air and hydraulic equipment. Emphasis is placed on some of the major reasons for unsatisfactory performance and steps which can be taken to avoid such conditions. Copies of the new book are free for the asking. Logansport Machine Co., Inc., Logansport, Ind. **(72)**

ELECTRICAL INSTRUMENTS. Burlington Instrument Co., Burlington, Ia., announces a new type of instrument and accessories catalog. This catalog has assembled outstanding characteristics of instrument design in respect to size, type of material of the case, and style of mounting and made them the subject of a consistent series of column headings, under which the consecutive sections are listed with prices for the different types of instruments such as microammeters, milliammeters, ammeters, voltmeters and other units. **(73)**

CRANES. If you like cranes, this handy, pocket-sized booklet is recommended reading. It tells the story of the Crane-Mobile in conversational style and is illustrated with sketches. **(75)**

SPRAY AND SUCTION HOSE. A specific hose for each type of spraying job is described in Quaker Rubber Corporation's Spray Hose Bulletin, just released. Another new Quaker Rubber bulletin describes eleven widely different types of suction hose to fill every industrial need. Copies may be obtained from the Quaker Rubber Corp., Division of H. K. Porter Co., Inc., Philadelphia 24, Pa., by using card below. **(74)**

TRAVELOADER. You'll have to send for this one; we haven't got the words to describe this piece of equipment that carries like a straddle truck, delivers like a road truck and stacks like a fork truck. Quite an item! Baker-Raulang Co., Cleveland, Ohio. **(76)**

PREFABRICATED CONVEYORS. It takes 80 pages, but Barber-Greene Co., Aurora, Ill., does an outstanding job in making clear, the erection and operation of any of their "Redi-Fab" conveyors. It's a complete manual. **(77)**

ELEVATOR BELTING. If you are using or plan to use bucket elevators, you'll find this bulletin from B. F. Goodrich Co., Akron, Ohio, very helpful. Not only does it plug the company's products but it gives many useful tables and shows you how to use them in designing a bucket elevator installation. There is also an extremely helpful section called "Elevator Belt Service Problems and Corrections." **(78)**

WELDING SAFETY. "Safety" is a 32-page booklet offered by Air Reduction Co., New York, N.Y. It is specifically designed for welding and cutting operators handling oxyacetylene and arc welding equipment.. Based on the principle that "safety is no accident," the booklet details safety cautions and rules for personal safety, the handling and maintenance of cylinders, torches, regulators and hoses. It discusses safe practices in setting up, adjusting, using and shutting down of the equipment. It's clear, concise, and uses sketches. **(80)**

CONTROLS AND GASES. A greatly revised edition of the handy Simplex general catalog of measuring and control equipment has been prepared by the Simplex Valve & Meter Co., Philadelphia, Pa. Bulletin 004 lists all Simplex equipment for measurement and control of liquids and gases. Illustrated are many types of controllers, gages, manometers, recorders, meters, valves, Venturi tubes, etc., all applicable for water and sewage works, power and processing industries. **(81)**

TESTING SIEVES. Newark Wire Cloth Co., Newark, N.J., has just published a new bulletin covering the Newark line of standard testing sieves, market grade testing sieves and the Newark testing sieve shaker. **(82)**

FLOW METERS. Catalog 2320 describes all types of flow meters made by Minneapolis-Honeywell's Industrial Division. It includes indicating, recording, integrating and controlling instruments of both evenly graduated and square root types, as well as area meters and differential converters. Also included is a section on flow approximations and installation information. **(83)**

ROCK BOLTING. A very informative booklet on rock bolting procedures and techniques has been prepared by Ingersoll-Rand Co., New York, N.Y. It is intended as a general guide for rock bolting techniques, and describes briefly a complete line of equipment manufactured for this application. Form 4155 deals with the theory of rock bolting and by means of simple, clear illustrations explains how it works. The article also outlines the advantages and disadvantages of the procedure. **(84)**

STEAM TRAP. V. D. Anderson Co., Cleveland, Ohio, have revised their 36-page catalog, "Solving Steam Trap Problems" to include information on their new combination float and thermostatic traps. In addition, contains specifications and

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to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

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AUGUST, 1954

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2	9	16	23	30	37	44	51	58	65	72	79	86	93
3	10	17	24	31	38	45	52	59	66	73	80	87	94
4	11	18	25	32	39	46	53	60	67	74	81	88	95
5	12	19	26	33	40	47	54	61	68	75	82	89	96
6	13	20	27	34	41	48	55	62	69	76	83	90	97
7	14	21	28	35	42	49	56	63	70	77	84	91	98

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capacities on steam traps, float traps, air release valves and pipe line strainers. Tells how to calculate condensation loads and select traps for all classes of equipment. Gives pointers on how to install and service traps. **(85)**

JACKS. This 40-page, illustrated manual explains how to choose the right jack for the job, lists the types of ratchet, screw and hydraulic jacks—from three to 100 ton capacities—and gives complete specifications for each jack. Duff-Norton Mfg. Co., Pittsburgh, Pa. **(86)**

POLY-V-BELT. A completely new concept of power transmission, the Poly-V Drive, has just been introduced by the Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N.J. Poly-V Belt, which is a single, endless rubber belt with a series of parallel V ribs molded lengthwise around the inside circumference, has an uninterrupted, high-strength member of synthetic cords across its entire width. The Poly-V drive is in the same general price range as V-belt transmission drives for comparable service. **(87)**

EASY REPAIRS. A 48-page illustrated pocket size handbook showing in detail methods for a wide range of repairs in the factory and home with "Smooth-On" repair cements, has been announced by Smooth-On Manufacturing Co., Jersey City, N.J. Text and illustrations present repair methods for leaks in pipes, boilers, radiators, concrete and cinder blocks and sheet and plate metal. Other sections show how to tighten loose parts in metal, wood or plastics. **(88)**

SCREENS. Simplicity Engineering Co., Durand, Mich., have announced an illustrated catalog (No. 66) covering their complete line of woven wire screens for repair and replacement. The catalog describes the methods employed to fabricate wire screening to exact specifications and lists the sizes and types of woven wire screen now available for immediate delivery from the company's warehouses. **(89)**

RUBBER HOSE AND BELTING. This 24-page catalog gives complete information and prices on many types of rubber hose and belting, made by Carlyle Rubber Co., Inc., New York, N.Y. **(90)**

CENTRIFUGAL PUMPS. For handling of abrasive pulps and corrosive liquids, Linatex Corporation of America, Rockville, Conn., states the case for its centrifugal pumps in 12 pages. Drawings and tables plus photographs supplement the discussion. **(67)**

RAIL ACCESSORIES. The following handy gadgets can be obtained at Miners' Hardware Supply, Pittsburgh, Pa.: Transition rails for changing from one rail size to another; compromise rail splicers to change from 30-lb to 40-lb rail; one piece and two piece running skids to control speed; permanent hinged and temporary (roller type) derails; rerailers; temporary switches easy to install without cutting main track; hill car holder; and streamlined switch signal. **(69)**

HARDFACING. "Duria" hard metal is a tungsten carbide material made in Germany. It has a wide range of applications. Where and how to use it is fully described in a very fine, 65-page manual published by Duria Werk, Germany. **(70)**

ROOFING AND SIDING. An 8-page brochure describing the use of V-CORR, an enamel-on-steel roofing and siding material, is available from Toledo Porcelain Enamel Products Co., Toledo, Ohio. It offers "complete protection against fire, corrosive gases, moisture, steam, smoke, salt air, and reduces roofing and siding costs in industrial plants to zero." **(68)**

MINE CARS. "Bethlehem Mine and Industrial Cars"—Catalog No. 354, Bethlehem Steel Co., Bethlehem, Pa., has 59 pages of textual matter and pictures describing the company's mine and industrial cars. Illustrated are cars of large and small capacities, 4-wheel trucks, all-steel construction, forged steel wheels, automatic couplers, side-dump and end-dump, floating drawbars and other features. **(91)**

VALVES. A comprehensive, completely illustrated four-page circular describing iron body, bronze mounted grooved end valves for grooved end couplings has been published by Lunkenheimer Co., Cincinnati, Ohio. Available in 2½- to 8-in. sizes in standard 200-pound W.O.G. **(92)**

FAULT FINDER. Parr Mfg. Corp., Newark, N.J., has issued a booklet describing the Brunt Faultfinder for location of grounds in normally ungrounded electrical circuits. Booklet is well illustrated and contains complete information regarding the purpose and operation of the several models. **(93)**

WIRE ROPE. John A. Roebling's Sons Corp., Trenton, N.J., has issued a new publication "Wire Rope Recommendations and Catalog," designed to provide a simplified ordering plan and reference for wire rope users. It is divided into 16 sections, one for each of the major industries which use wire rope, each clearly marked by index tabs for quick reference. Gives detailed information on wire rope for specific requirements. **(94)**

DRILLS AND BITS. Mining tool catalog which covers its full line of standard stocked cemented carbide mining tools, is announced by Carboloy Department, General Electric Co., Detroit. Complete information including design specifications is given on cutter bits, finger bits, auger drills and roof bolting drills in 18-page catalog CM-120. **(95)**

CONCRETE FLOORING. A 3-color, four-page folder published by the Flash-Stone Co., Philadelphia, Pa. The folder points out that this flooring operation, "Dynapakt," performed with special power equipment to insure maximum compaction and adhesion of concrete and metal-chip composition, features an eighth-inch "veneer" of iron-chip aggregate as a non-spalling, non-crumbling, non-slip armor over fresh Dynapakt concrete topping. **(96)**

AIR-OPERATED BUTTERFLY VALVES. Bulletin 1701 contains specifications of Continental Butterfly valve bodies and the new Honeywell Series 800 diaphragm motor operators. Complete tables of allowable pressure differentials are included to facilitate selection of properly sized bodies and operators. Minneapolis-Honeywell Regulator Co., Philadelphia, Pa. **(97)**

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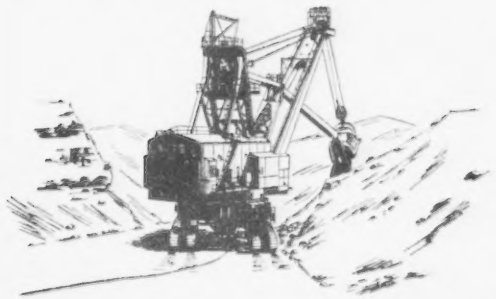
For safety... maximum service life...

ROECLAD TYPE SH-D TRAILING CABLE



BUILT FOR heavy duty service on such equipment as shovels, draglines and dredges. This cable is designed to provide maximum protection for workmen and longest life on the job under the most arduous conditions.

CONSTRUCTION

Conductors are tinned copper wire, rope stranded for extra flexibility.

Insulation over conductors is ozone and heat resistant, high voltage rubber compound.

Cabling — Multiple conductor cables are cabled together with rubber fillers (for greater flexibility, jute fillers may be specified).

Reinforcing braid is seine twine, for greater impact and tear resistance.

Jacket is made of thick Roebling Roeprene (neoprene), lead mold cured to give the cable firmness and compactness. The jacket is highly resistant to impact, abrasion, moisture, sun-cutting and deterioration from oil and chemicals.

If you want more information call your nearest Roebling office (listed below) or your Roebling distributor, or write to John A. Roebling's Sons Corporation, Trenton 2, N. J.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. & 5 PITTSBURGH ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HGTS. BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, ROOM 239, HENRY W. OLIVER BLDG. • ROCHESTER, 1 FLINT ST. • ST. LOUIS, 3001 DELMAR BLVD. • SALT LAKE CITY, 526 W. 8TH SOUTH ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

Front-wheel drive, big air brakes, plus the rear dumping action, make it easy for the operator to dump his entire load cleanly and safely over edge of soft spoil bank.

During construction of ramp, haulers' big 21.00 x 25 low-pressure tires tightly compact fill, eliminate sink-holes experienced when ramps were built by crawlers and pans.

Stripping costs reduced more than 30% with new-type haulers

Kleenbirn Collieries had always hired crawlers and scrapers to strip overburden from their coal beds northeast of Lethbridge, Alberta. Looking for a way to lower costs, the Company in 1952 bought 3 C Tournapull Rear-Dumps and a 3½-yd. stripping shovel.

In their first full season (April to November), this team accounted for 578,000 yds. of overburden, sandstone and shale. In the first 3 months of the following season, working a shorter day, the units hauled 112,000 bank yards. Per-yard costs were *less than 35% of the cost* of the last year crawlers were used, and 30% less than *any* of the 10 previous years when crawlers were used. These costs include depreciation and interest on the equipment investment.

Haul up 9½ to 12½% grades

To date, the Rear-Dumps have spent about half their time hauling the dirt and shale overburden pictured, the other half hauling shot sandstone and coal. Loads in clay, earth and shale average 12 bank yards . . . in rock, 9 bank yards. Maximum grades vary from 9½ to 12½%. "These 18-ton LeTourneau-Westinghouse Rear-Dumps are ideal for work with a 3½-yd. shovel," says Foreman W. E. Herrick. "They are the best hauling units for our kind of work."

Rear-Dumps build ramps

One of their most important jobs according to Herrick, is building ramps. Constructed of overburden, these connect pit with spoil pile and coal haul roads. They average 50′ wide, 50′ high, and 250′ long. Not only was their construction long and costly with crawlers and scrapers, but necessary compaction could never be achieved. This caused bad sink-holes to develop. "Now," says Herrick, "with a crawler for leveling and Tournapull Rear-Dumps for hauling, we build the ramps much faster. Also, we get better compaction and no sink-holes."

A demonstration on *your* work will show you specifically the many ways LeTourneau-Westinghouse Rear-Dumps can cut haul costs. Call us today to arrange time and place.

Recently, Westinghouse Air Brake Company purchased from R. G. LeTourneau, Inc. their earthmoving and related products together with their Peoria, Toccoa, and Australian factories. Adding the high quality standards, precision manufacturing experience, and research facilities of Westinghouse Air Brake to the earthmoving developments of LeTourneau, gives you assurance that the improved line of equipment offered by this strong new company is the finest on the market.

Tournapull—Trademark Reg. U.S. Pat. Off. R-565-M

LeTourneau-Westinghouse Company

PEORIA, ILLINOIS

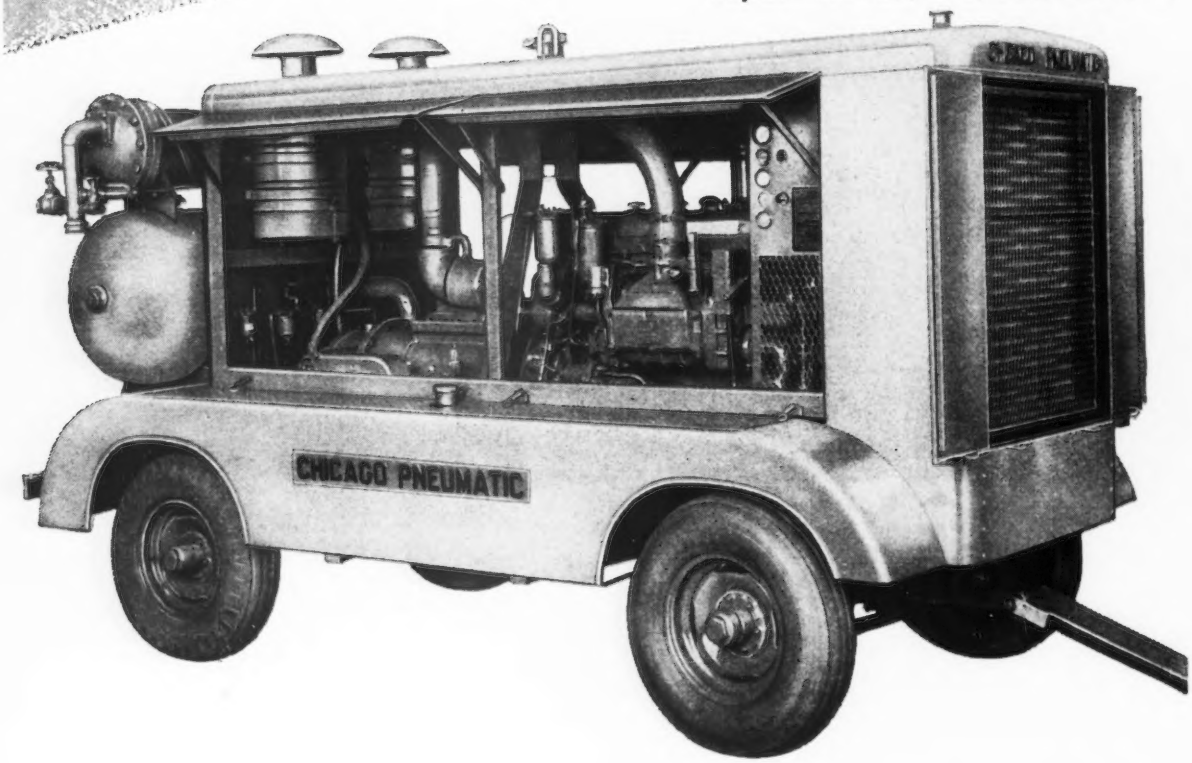
A Subsidiary of Westinghouse Air Brake Company

18-ton LeTourneau-Westinghouse Rear-Dump is loaded with 4 passes of 3½-yd. shovel.

Kleenbirn Collieries has been mining coal here since 1919. Seam now being uncovered is 4½ ft. thick. Overburden, mostly shale and clay, is 30 ft. thick. When winter stops mining, LeTourneau-Westinghouse units haul stockpiled coal to loading bunkers located 1½ miles from pit. From here, coal is hauled by truck to nearby towns.

WEIGH LESS

Capacities: 125, 210, 365, 600 cfm.

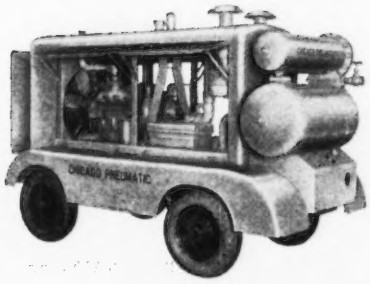


. . . CP ROTARY COMPRESSORS

After 18 months of proving themselves on the job, CP Power Vane Rotary Compressors are now available in sizes of 125, 210, 365, and 600 cfm. Having no pistons, connecting rods, valves or other reciprocating parts to maintain, they afford thousands of hours of trouble-free service. Their oil injection system provides copious lubrication, cools the air during compression and assures long rotor blade life . . . yet oil consumption is remarkably low and air is delivered practically oil-free.

Smooth running CP Rotary Compressors also have a variable speed capacity regulator which prolongs life and reduces wear and tear . . . increases over-all economy. CP Rotaries are available with Hercules gasoline and General Motors diesel engines. For more information, write for Bulletin SP-3084-2. *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

THAN PISTON TYPES OF HALF THE CAPACITY...



Three ways better...

1 **Tapered roller main bearings** afford positive positioning of rotor between compressor cylinder end plates.

2 **Safety friction drive** between engine and compressor limits transmitted torque—provides added protection for engine and compressor against shock.

3 **Perfect alignment of all parts** is afforded by metal-to-metal joining of housings and fitted-step construction of mating surfaces and shaft-mounted parts.

IDEAL WHERE **PORTABILITY** AND **RELIABILITY** COUNT!

- CP Portable Power Vane Rotary Compressors occupy 30% less space than equivalent piston type machines.
- Compressor weighs less, is more compact than piston type machines of half the capacity.
- Due to oil injection, discharge air is 100° lower than in equivalent piston type compressors.
- Spring suspension, automotive steering on four wheel models, tilt operation, compactness and light weight make CP Rotary Compressors ideal for towing and maneuvering anywhere.
- Rotary shaft seal at drive end excludes dirt from shaft bearings.
- Automatic safety controls stop engine in case of excessive water temperature or oil failure.

CP

Chicago Pneumatic *8 East 44th Street, New York 17, N. Y.*

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

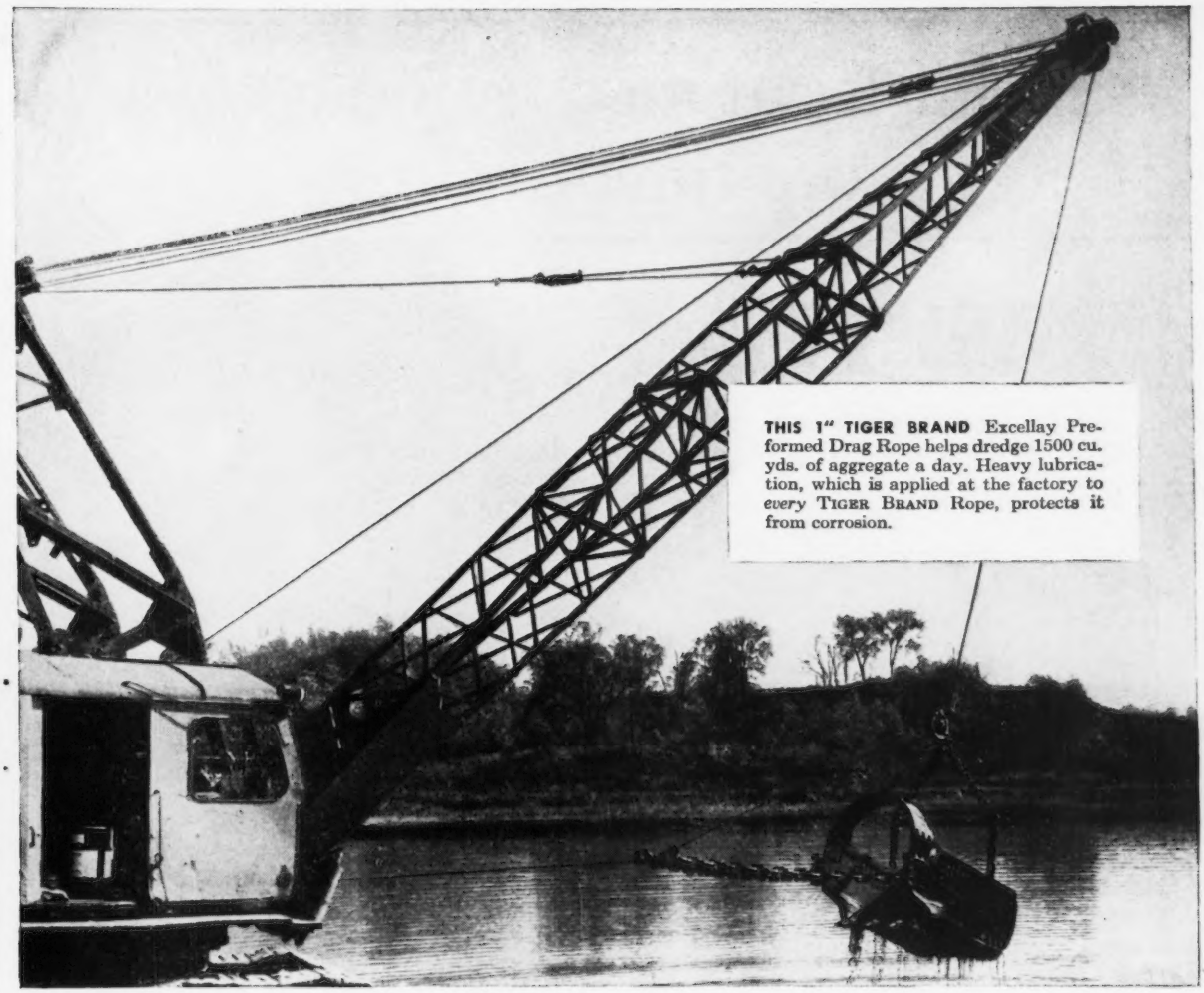
"Abrasion and corrosion *the worst*... Tiger Brand Wire Rope *the best!*"

says C. G. TUGEND, FREDERICKTOWN SAND & GRAVEL CO.

EVERY ROPE on all 5 excavating and materials handling machines at Fredericktown Sand & Gravel Co. is TIGER BRAND. This important stone processing company consults frequently with American Wire Rope Engineers and follows their recommendations to get the best possible service from each rope.

● If you want to know how good TIGER BRAND Rope is, just talk to C. G. Tugend, Secretary-Treasurer and General Manager of Fredericktown Sand & Gravel Co. in Fredericktown, Ohio. Here's what Mr. Tugend says about TIGER BRAND:

"We have some of the toughest operating conditions I've ever seen for wire rope. We're dredging in corrosive river water that is 7% sodium sulfate. On top of that, our drag ropes have to scrape through hard glacial rock



THIS 1" TIGER BRAND Excellay Preformed Drag Rope helps dredge 1500 cu. yds. of aggregate a day. Heavy lubrication, which is applied at the factory to *every* TIGER BRAND Rope, protects it from corrosion.

along the river. TIGER BRAND Rope works in these conditions constantly, yet has never shown any sign of rust and requires only a normal replacement. That's why we use it exclusively on all our equipment.

"We did try a different brand of rope *once* . . . on our 2½ cu. yd. Sauerman Hoist. But that will be the last time. The new competitive rope carried the same catalog specification as the TIGER BRAND Rope it replaced, yet the new one lasted less than ⅓ as long, contracted unevenly, and kinked so badly that it jammed the pulleys. We spent 6 days repairing that rope . . . lost 9,000 tons of production.

"Since that costly experiment, we've been using TIGER BRAND Rope *exclusively*. It has never shown a tendency to kink; and it is extremely pliable and strong. It has never given one bit of trouble."

For ropes that will give *you* high quality service, time after time, specify TIGER BRAND. Send the coupon for more information.

American Steel & Wire
Rockefeller Building
Cleveland 13, Ohio.

Please send me, without obligation, a copy of your helpful wire rope recommendation book, "The Right Rope for the Job."

Name.....

Company.....

Address.....

City.....State.....

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

UNITED STATES STEEL

Spend less time changing bits more time drilling

TIMKEN® ROCK BITS ARE INTERCHANGEABLE

NO need to waste valuable drilling time switching steels. With Timken® interchangeable rock bits, you can switch quickly from one bit type to the other —right on the job. Dozens of different Timken multi-use and carbide insert bits screw right on the same threaded drill steel!

Because both Timken multi-use and carbide insert bits fit the same steel, there's no need to stock expensive double inventories of drill steels. In addition, both Timken bit types give these other two advantages: 1) made from electric furnace Timken fine alloy steel, 2) special shoulder union keeps drilling impact from damaging threads.

If you have a drilling problem, be sure to call upon our rock bit engineers. They're backed by over 20 years' experience in selecting the most economical bits for every drilling need. There's no obligation. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO."

WHERE YOU CUT COSTS WITH TIMKEN MULTI-USE BITS

Most economical for ordinary ground. With correct and controlled reconditioning, they give lowest cost per foot of hole when full increments of steel can be drilled.

WHERE YOU CUT COSTS WITH TIMKEN CARBIDE INSERT BITS

Give highest speed through hard, abrasive ground. Also most economical for constant-gage holes, small-diameter holes, very deep holes.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

your best bet for the best bit ...for every job

TRI 55 CLAD THE LEADER IN MODERN MOTOR DESIGN

ROTATING SEAL on the motor shaft will not attract fine taconite dust, helps keep out dirt.

NEW SEALING COMPOUND applied on the rabbet fits helps keep dust from vital motor parts.

TEXTOLITE* FAN cannot be clogged by magnetic taconite dust—resists acids and alkalis.

DUST-PROOF gasket adds protection. Big conduit box, numbered leads ease maintenance.

Built even for taconite's toughest processes . . .

G-E TRI 55 CLAD enclosed motor keeps out dust, dirt and grit!

REG. U.S. PAT. OFF.

General Electric's all-new Tri Clad '55' enclosed motor is better sealed against dirt, grit and magnetic dust. That's why it's the ideal workhorse for difficult jobs such as taconite screening, classifying, filtering, magnetic cobbering and magnetic separating.

Here are some of the protection features that add to the life of this new motor. Cast iron end shields and frame have tightly sealed rabbet fits. A non-magnetic seal is on the motor shaft to keep fine dust out of the bearing housing. A rubber gasket protects lead entry to the stator; conduit box is also gasketed.

This protection naturally suits the Tri Clad '55' motor to tough applications throughout mining industries. For hazardous locations, G-E Bureau of Mines approved motors are the correct choice.

General Electric Tri Clad '55' motors are now available in many ratings. The complete line of 1 to 30 hp a-c motors will be available soon. For full details contact your G-E Apparatus Sales Office or G-E Motor Supplier today. Write for Tri Clad '55' bulletins GEA-6012—Enclosed motors, GEA-6013—Dripproof motors, GEA-6027—Gearmotors. General Electric Company, Section 648-10, Schenectady 5, N. Y.

*Reg. trade-mark of General Electric Co.

Progress is our most important product

GENERAL ELECTRIC

WESTMORELAND COAL HAS FOUR G-E 25-TON DIESEL-ELECTRICS AT ITS HAMPTON MINES. ONE LOCOMOTIVE HAULS AS MANY AS SIX LOADED CARS PER TRIP.

6 reasons why . . .

You can get more productive surface haulage with a G-E diesel-electric locomotive

1. FULL UTILIZATION OF POWER—electric transmission delivers full power for all normal speed and tractive effort requirements.

2. HIGH AVAILABILITY—in normal service, you can expect a G-E diesel-electric to be on the job 24 hours a day, seven days a week, with only about eight hours out for maintenance. It carries sufficient fuel for several days. Refueling and oiling can be carried out during shift changes.

3. FAST, FLEXIBLE POWER—helps speed up your haulage. Response to the throttle is instantaneous. Acceleration is quick and smooth. Reversing is a simple operation.

4. SIMPLIFIED MAINTENANCE—there's no fire-cleaning, ash-handling, watering, or watching, because a G-E diesel-electric does not have boiler or fire-box. Neither does it have mechanical transmission with its inherently high maintenance.

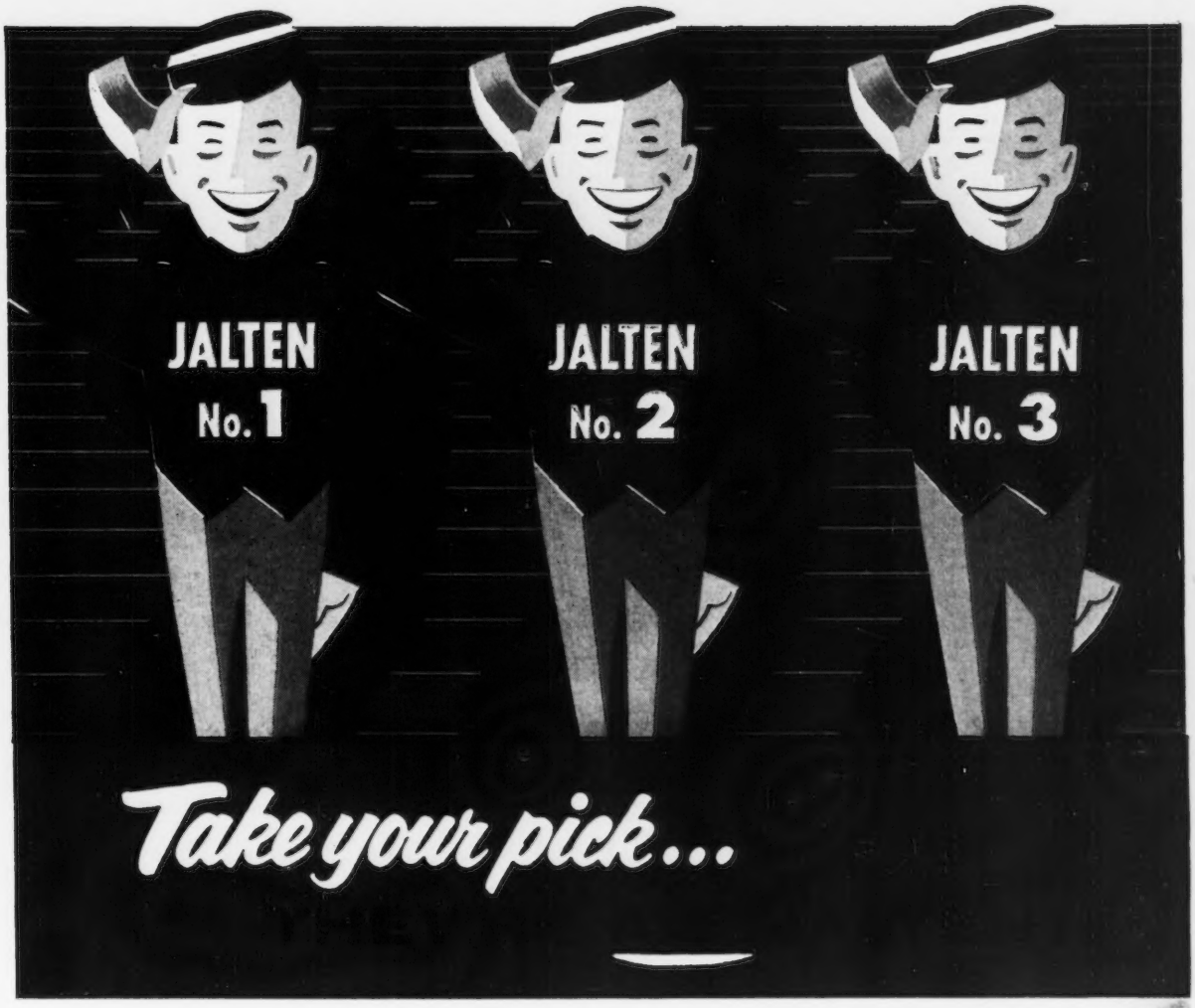
5. EASIER ON THE TRACKS—smooth traction, short wheelbase, low weight per axle, add up to less wear on your tracks. A G-E diesel-electric has no dynamic augment or heavy reciprocating parts to place undue strain on the tracks.

6. HAZARDS REDUCED—the G-E diesel-electric does not emit smoke or harmful gases. It is ideal for use in mining operations.

G.E. makes diesel-electric locomotives in seven standard sizes: 25, 35, 45, 50, 65, 80, and 95 tons. Ask your G-E Apparatus Sales representative for more details about them. Or, write to: General Electric Co., Section 120-70, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC



J&L's New JALTEN series enables you to select low-alloy, high-strength steel in the following combinations of advantages:

High strength, good formability and fabricating —good resistance to low temperature impact.

High strength, moderate forming—improved resistance to atmospheric corrosion.

High strength—improved resistance to abrasion.

Remember to specify JALTEN High Tensile Steel for

- **HIGH STRENGTH • RESISTANCE TO CORROSION**
- **GOOD FORMABILITY • RESISTANCE TO ABRASION**

Jones & Laughlin
STEEL CORPORATION – *Pittsburgh*

The data you want is in this book:

- Chemical Properties of Jalten
- Mechanical Properties of Jalten
- Jalten Equivalents
- Jalten Application Data

Jones & Laughlin Steel Corporation
Dept. 412, 3 Gateway Center, Pittsburgh 30, Pa.

Please forward a copy of your booklet, Jalten low-alloy, high-strength steel.

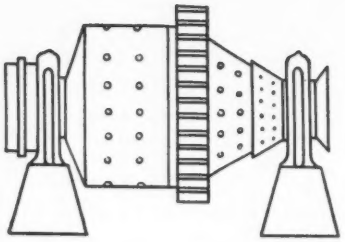
Name _____

Company _____

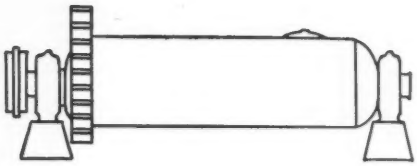
Address _____

grinding balls

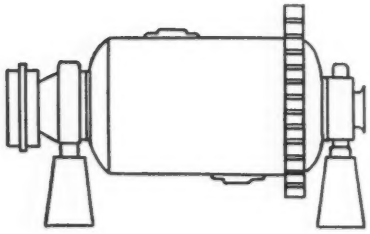
best for any type of mill



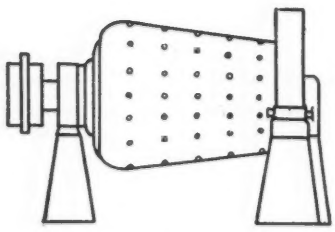
CONICAL MILLS



TUBE MILLS



CYLINDRICAL MILLS



TRICONE MILLS

When you use CF&I Grinding Balls you'll get even wear, resistance to impact and high through-put. Special treatment and controlled analysis steel assure high hardness rating with the necessary toughness to give maximum service in all sizes and types of grinding mills operating at either high or low speeds.

CF&I Grinding Balls are carefully forged and inspected to assure long life—are free of surface pits, circumferential ridges and other surface unevenness.

CF&I PRODUCTS FOR THE MINING INDUSTRY

Cal-Wic Wire Cloth Screens • Mine Rails and Accessories • Wickwire Rope • Rock Bolts • Grinding Balls • Grinding Rods

CF&I

FORGED STEEL GRINDING BALLS

THE COLORADO FUEL AND IRON CORPORATION

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2540

an ACCO product

American Cable "Green Strand" Wire Rope

What Wire Rope Do You Use on Your Carrier Scrapers?

• A complete description of a scraper cable is as long as your arm. But all you have to remember, if you are buying American Cable, is simply: TRU-LAY Streamlined Scraper Cable. And here's what you get, and why—

6 x 25 Flattened Strand—This means six strands of twenty-five wires each wound around triangularly shaped wires in the center of each strand. One flat side of the center wires of each strand faces out providing a relatively flat surface on the strand. The outsides of the six strands together make a smoother surface which gives the rope a much better bearing area against small sheaves and drums.

Independent Wire Rope Core—This adds considerably to the rope's breaking strength, and provides a solid steel core which keeps the rope from pulling down or flattening out on the small sheaves of a carrier scraper.

Lang Lay—When the wires in the strands are laid in the same cross-direction as the strands in the rope, the rope is Lang Lay. This makes the rope last longer because more of the outside wires are exposed to wear. It also makes the rope withstand more bending because of the helix of the wires. The crankiness of Lang Lay is removed by American Cable by preforming.

TRU-LAY Preformed—American Cable's Streamlined Scraper Cable is preformed to make it handle easier and last longer in bending around small sheaves. When wires do break, they stay in place instead of barbing out to slice hands and snag clothing.

Improved Plow Steel—That's what TRU-LAY Preformed is made of. The wire in this all-steel wire rope has an average tensile strength of 260,000 pounds per square inch. Look for the *green strand* which identifies this strong wire rope.

Just ask for TRU-LAY Streamlined Scraper Cable next time and every time you need rope for your carrier scrapers. You can also use it for the blade rope on your bulldozers. Your American Cable distributor stocks it and can give you quick service. Call him today or write our Wilkes-Barre, Pa., office for further information.

ACCO

TRADE MARK

American Cable Division

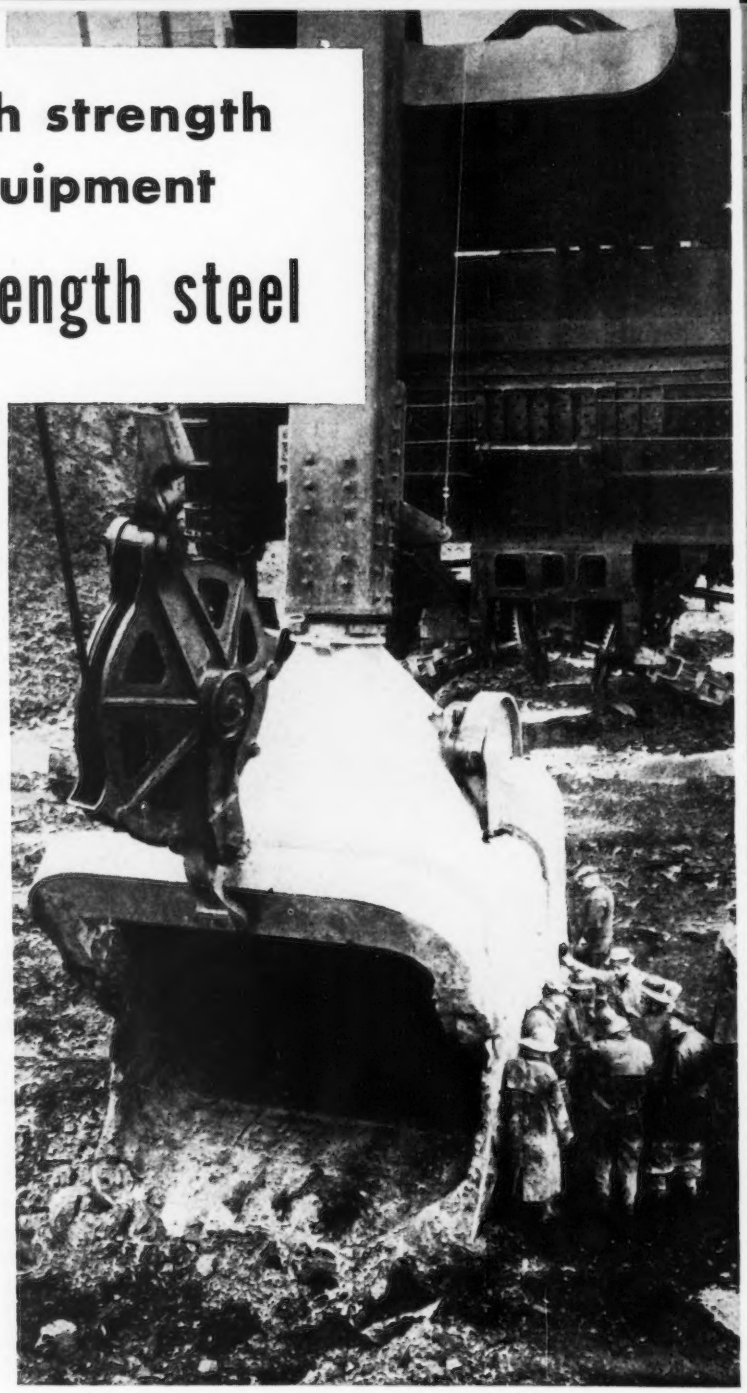
AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.

plus ACCO Registered Wire Rope Slings

When you want high strength in your mining equipment

start with a high strength steel



USS TRI-TEN STEEL gives you high strength plus high resistance to impact at low temperatures This tough, versatile steel is ideal for use in heavy-duty equipment which must operate in sub-zero weather. For it retains its toughness and withstands shock under low temperature conditions. Will keep your shovels, draglines and dozers going when others fail.

USS COR-TEN STEEL gives you high strength plus high resistance to corrosion This high strength steel has 4 to 6 times the resistance to atmospheric corrosion of ordinary structural steel, and 2 to 3 times that of copper steel. This property helps to assure long life and low maintenance cost in mine cars and similar equipment subject to atmospheric corrosion.

USS MAN-TEN STEEL gives you high strength plus resistance to abrasion This lower-cost grade has a higher resistance to abrasion than ordinary carbon steel. In addition to high strength and toughness, it has workability and weldability to a higher degree than obtainable in carbon steel at the same strength level.

• • •

● Used singly or in combination, these USS High Strength Steels will give your equipment the strength and stamina to work faster and last longer—to boost production, to cut repair costs. For all these famous steels have a 50% higher yield point, and greater resistance to wear, impact, abrasion and fatigue than ordinary carbon steel.

You can use any of these USS High Strength Steels in the same thickness as carbon steel to increase the strength and durability of equipment, without increasing its weight. Or, by substituting these steels in thinner sections for carbon steel, you can reduce the weight of the equipment without reducing its strength. Or, on certain applications, you can increase the size and capacity of equipment without increasing its weight.

For more information or application data concerning USS High Strength Steels, call or write our nearest office.

NEW BOOK GIVES COMPLETE STORY OF USS COR-TEN STEEL

Just off the press, this 58 page book is crammed with factual data about USS COR-TEN Steel. Contains list of mechanical properties and characteristics, shows savings that can be affected through its use. Send for your free copy today.

UNITED STATES STEEL CORPORATION, PITTSBURGH · AMERICAN STEEL & WIRE DIVISION, CLEVELAND · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. · UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS HIGH STRENGTH STEELS

USS

4-1028

UNITED STATES STEEL

"Here's Good News for us Blasters..."

We have always claimed that Primacord is not affected by stray currents and cannot be set off by friction, sparks or ordinary shock. But lightning! . . . no one knew what lightning would do . . . until now!

The incident took place on a pipe line job in Kentucky. Primacord branch lines were hooked up to the trunk, but the detonator had not been attached. The crew left the job when the thunderstorm warning came — and when they returned they discovered that lightning had struck the Primacord in two places, but had failed to detonate it. About six feet of trunk line was gone, and the free ends appeared to have been melted off. The branch line Primacord from four holes, previously tied into the trunk, were also burned off to the collars of the holes. Another burned out section of the trunk line, about two feet long, was found twelve feet away.

New lengths of Primacord were tied onto the trunk and branch lines, and the blast was shot when all was ready.

This is good news for blasters — especially during the thunderstorm season, or where high voltage electrical equipment is on the job. P-16

Ask your explosives supplier or write for further facts to

THE ENSIGN-BICKFORD COMPANY
Simsbury, Connecticut
Also Safety Fuse since 1836

PRIMACORD® *detonating fuse*

PROVED and APPROVED

Bethlehem Hollow Drill Steel rips into medium-hard quartzite at face of the crosscut. The drill steel was supplied by Bitco, Inc., Wallace, Idaho.

New 8500-ft Tunnel for Lead Mine in Idaho

Lee Messerly (left), superintendent, and Ralph Neyman, general manager of Hecla Mining Company, stand inside tunnel portal.

The task was a formidable one. Yet, because the advantages were obvious, the Hecla Mining Company pushed ahead with its bold plan for a tunnel in its lead and zinc mine at Burke, Idaho.

The tunnel, a 10 ft x 11 ft bore, was driven from the Hecla Plant to intersect Hecla's main Star Mine Shaft on the 2000-ft level, nearly two miles away. Its purposes were many: (1) to improve ventilation (2) eliminate hoisting (3) eliminate pumping of 100,000,000 gal of water yearly (4) reduce transportation time in reaching the working faces (5) carry a 13,200 volt cable to underground machinery, and (6) reduce operating costs.

Construction of the tunnel was handled by Sullivan Mining Company, a subsidiary of both the Hecla Mining Company and the Bunker Hill & Sullivan Mining and Contracting Company. Lee Messerly was the superintendent in charge.

In the drilling operation, approximately 33,000 cu yd of medium-hard quartzite were removed by means of drifters. Blast holes ranged from 8 ft to 10 ft deep. The contractor reports that the large tonnage of Bethlehem Hollow Drill Steel used on the project – 1⅛ in. round and fitted with carbide-insert bits – turned in an excellent performance.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

Two Grades of

BETHLEHEM HOLLOW DRILL STEEL

CARBON • ULTRA-ALLOY (chrome moly)

BETHLEHEM STEEL

Take a look at SILICA SAND

Galigher Beneficiation

GALIGHER PRODUCTS

Agitair Flotation Machines . . . Commercial and Laboratory Agitair . . . Laboratory Ball Mills . . . Geary-Jennings Samplers . . . Geary Reagent Feeder . . . Laboratory Pressure Filters . . . Acid-Proof Sump Pumps . . . VacSeal Pumps.

The two strips above are enlarged photographs of silica sand with natural impurities and the same sand after beneficiation in the Galigher laboratory. The flow sheet required for this particular sand provides the economical procedure for a premium optical glass. Some other non-metallic problems that have been successfully solved by Galigher metallurgists are as follows: Barite, Fluorspar, Vanadium, Columbium, Tantalum, Coal and Coal Sludges, Graphite, Phosphate, Spodumene, Feldspar, Sulphur, Rare Earth, Mica, Cement Rock. Galigher metallurgists, with experience and technical knowledge gained through more than 1200 different mineral dressing problems of world wide scope, are qualified to custom design a flowsheet for your problem. Galigher services in addition to flowsheet development, include detailed plant design and construction.

For authoritative information that applies to any special problem in this field, feel free to write us.

HOME OFFICE
545 West 8th South
Salt Lake City, Utah
P. O. Box 209

EASTERN OFFICE
921 Bergen Avenue
Jersey City, New Jersey

Agents In All Principal Foreign Mining Districts

THE GALIGHER CO.

METALLURGICAL DIVISION · THE GALIGHER COMPANY · ENGINEERING SERVICE

CONSULTATION • ORE TESTING
PLANT DESIGN • GEOLOGIC INVESTIGATION

Link-Belt Model K-595 dragline working for Strasburg Clay & Coal Company near Baltic, Ohio. Rig has 3½-yard bucket, 80-foot boom.

"Doubles cable life—cuts operating costs"

THAT'S what Edward "Rusty" McGinness, owner of the Strasburg Clay & Coal Company, reports after 5000 hours' tough stripping with his TORQMATIC-equipped Link-Belt dragline.

And with the Allison TORQMATIC Converter automatically absorbing shock loads he's kept repairs to a minimum—only $24.00 in replacement parts on the drag, no repairs to the converter. The rig strips 100 tons of coal a day, uses 6 gallons of low-cost Diesel fuel an hour.

At first, Rusty was skeptical about having a TORQMATIC Converter. Now he calls it the "best unit ever made for a rig." And he should know—he's been in the coal business 15 years, has run every kind of mining equipment. Rusty reports the torque converter automatically protects cables, boom and engine from damage by absorbing sudden shocks.

There's a TORQMATIC Converter for a wide range of hard-working units from 40 to 400 horsepower. TORQMATIC DRIVES, the *matched* converter-transmission team, cut costs and boost production in trucks, scrapers, and other big equipment.

Many operators have converted their direct-drive units to TORQMATIC DRIVES to get better performance and longer equipment life. Ask your equipment manufacturer or dealer about Allison TORQMATIC DRIVES in your units. For engineering details and specifications, write direct.

Allison Division of General Motors
Box 894M, Indianapolis 6, Ind.

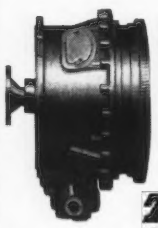
ALLISON TORQMATIC CONVERTER

Simple Design — one-piece cast converter elements — minimum maintenance

Compact, easy to install in existing equipment

Designed for power applications in the 40 to 400 hp range

Longer Equipment Life —absorbs shock, eliminates engine lugging, cuts maintenance costs



GM GENERAL MOTORS

Allison

TORQMATIC DRIVES

COMPACT, EFFICIENT HYDRAULIC DRIVES FOR CRANES • TRUCKS • TRACTORS • SCRAPERS • SHOVELS • DRILLING RIGS

Cyanamid REAGENT NEWS

DRY AEROFLOAT® PROMOTERS

selective and synergistic

This group of nine Dry AEROFLOAT Reagents was developed to provide the powerful, selective promoting properties of Liquid AEROFLOAT Promoters in dry reagents having little or no frothing characteristics. They have a wider range of promoting and collecting properties than comparable liquid promoters and are compatible with all types of frothers.

Being water soluble, Dry AEROFLOAT Promoters are easy-to-feed even in small quantities; 5% to 10% water solutions are commonly used. Frequently, they are used as "boosters" for Liquid AEROFLOAT Promoters to increase promoting power without affecting froth characteristics.

Combinations of Dry AEROFLOAT Promoters with xanthates, the 400 Series Cyanamid Reagents or Liquid AEROFLOAT Promoters produce a synergistic effect whereby the dual promoter gives better results than equivalent amounts of either promoter alone.

Very substantial tonnages of Copper, Zinc, Gold and Silver ores are being floated with AEROFLOAT 203, 208, 211, 213, 226, 238, 243, 249 and Sodium AEROFLOAT Promoters.

Cyanamid Field Engineers can help you to short-cut your own testing by giving you the benefit of their knowledge of previous experience with AEROFLOAT Promoters, alone and in combination with various other promoters.

AMERICAN Cyanamid COMPANY

MINERAL DRESSING DEPARTMENT

30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y.

Cable Address — Limenitro, New York

NORTH AMERICAN CYANAMID LIMITED
Royal Bank Bldg., Toronto 1, Ontario, Canada
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Aldwych, London W. C. 2, England
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Correo 11, Santiago, Chile
G. B. O'MALLEY, MALCOLM GLEN,
377 Little Collins St., Melbourne C. 1, Australia

BEST NEWS* in your business!

* a choice of either cab-controlled hydraulic dumping, or remote-controlled dumping by external hoist.

* an unlimited choice of speed, capacity, and gradeability in truck body, trailer or tandem designs depending upon the requirements of your job.

* the *only* way that you can use tandem units . . . and that means extra capacity, extra versatility.

* unlimited choice of the prime mover of any make best suited for your job.

* smooth, straight-line operation . . . no backing and turning at the dumping point . . . your drivers can see where they are going, see where they are dumping, at all times . . . ease and comfort that can't be beat.

* extreme simplicity of design in body and dumping mechanism for lasting durability, less downtime, less maintenance.

* rugged, all-welded construction for heavy rock and ore, lighter construction for lighter bulk materials.

* optimum balance of loading, hauling, and dumping equipment for smoothest, most efficient production at lowest cost.

EASTON cannot recommend side-dumping unless an impartial survey proves it to be the *right* method for your job. An EASTON "okay for side-dumps" means that your haulage requirements are *right* for all the advantages that side-dumping can bring you. *That's the best news in your business!*

It pays to know *that your job requirements are* right *for the simple principles of side-dump hauling. Our survey of your transportation problem costs you nothing, does not obligate you in any way. Write today for complete information.*

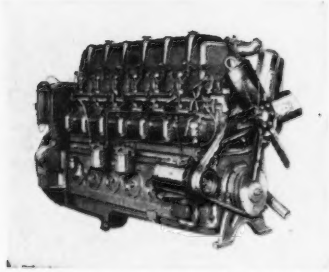
B-1064

Easton Car & Construction Company • Easton, Penna.

EASTON®

FIRST IN SIDE-DUMP ENGINEERING

reduced to $16.32



Horsepowers, 30 to 255. Two-cycle. 2, 3, 4, 6-cylinder models. Speeds to 1800 rpm. Stationary, mobile, marine. Diesel-generator sets

We can't sell you just one. We will sell you 30 to 255 "horses" at the lowest price you can buy diesel power: $16.32 a horsepower for the 6-cylinder model.

If you know diesel, you know there is nothing else like it. A diesel will take on any job you might give to a gasoline engine — and do it for one-third the cost. Not only that, it is simpler to maintain.

Buyers no longer ask *whether* diesel but *which* diesel. Which will deliver the most horsepower for the money? The most horsepower per pound of weight? Which is the easiest to service?

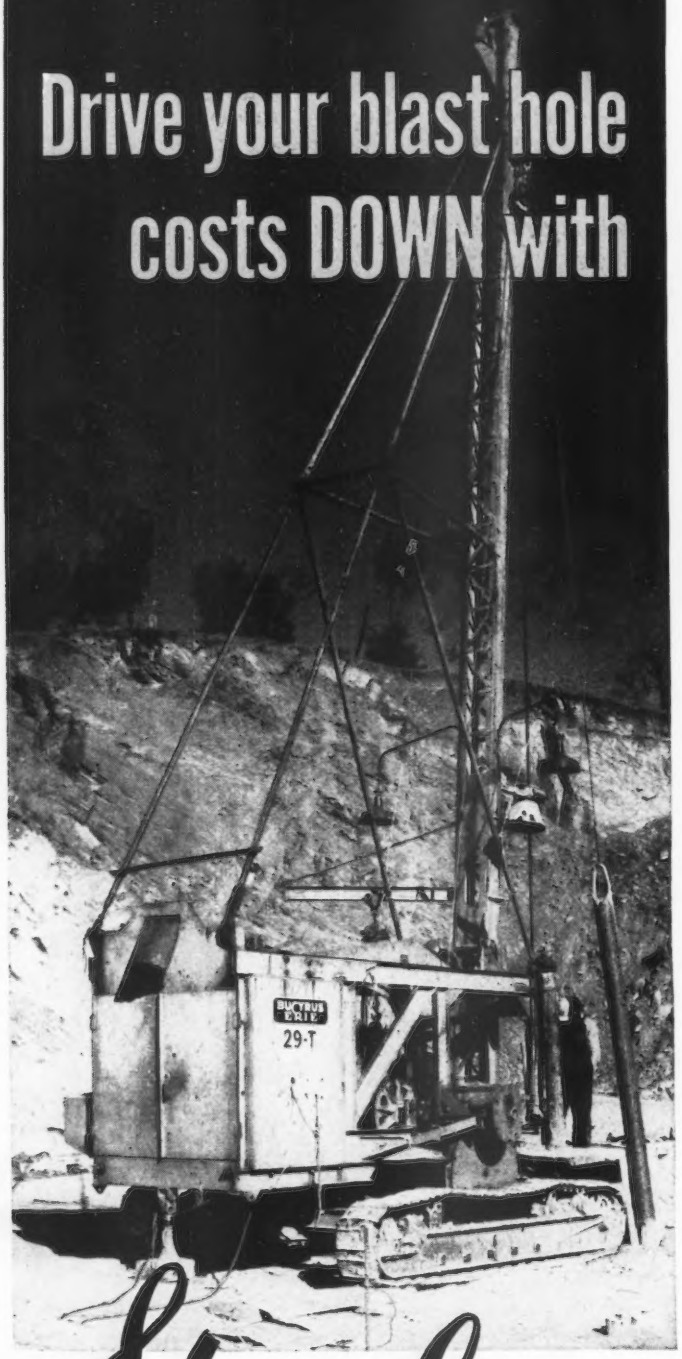
All three questions have one answer: *the P&H Diesel.*

P&H Diesel Engine Division, Harnischfeger Corporation, Crystal Lake, Ill.

THE P&H DIESEL

lowest price per horsepower . . .
lowest weight per horsepower

Drive your blast hole costs DOWN with TIREX



Economic churn drill operation demands extreme cable dependability. High temperatures caused by summer sun and high current load, accidental run-overs by trucks, and impact against sharp rocks demand a cable with high stamina. Simplex-TIREX Portable Cables were designed and engineered especially to meet the needs peculiar to mining.

TIREX is the only portable cable that has Selenium Neoprene Armor. This armor was developed by Simplex especially for mining cables. It is the toughest, hard-service jacket known. It resists acids, alkalies, chemicals, flame, moisture, oil, and sunlight. It is *cured in lead* to provide the toughest, longest-lived jacket possible.

Churn drilling is no place for weak-kneed cable that may cause breakdowns, tie-ups, or work stoppage of any kind. For such a vital operation, buy TIREX from your nearest Simplex distributor.

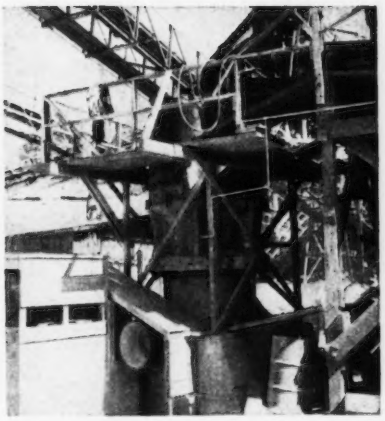
Simplex WIRES & CABLES

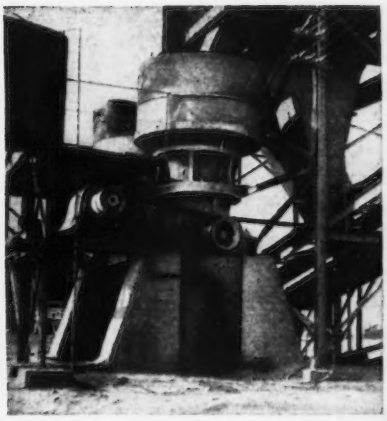
TIREX CORDS AND CABLES *are made only by the*

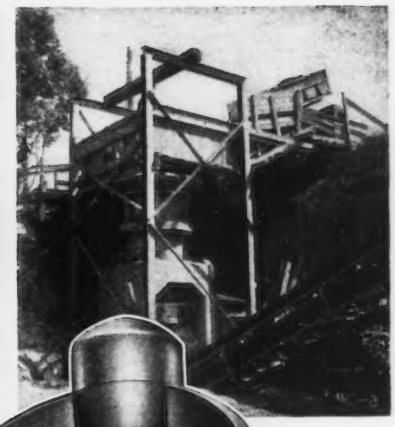
SIMPLEX WIRE & CABLE CO., 79 Sidney St., Cambridge 39, Mass.

806 OWNERS OF TRAYLOR TY REDUCTION CRUSHERS SAY

Production is the Payoff...





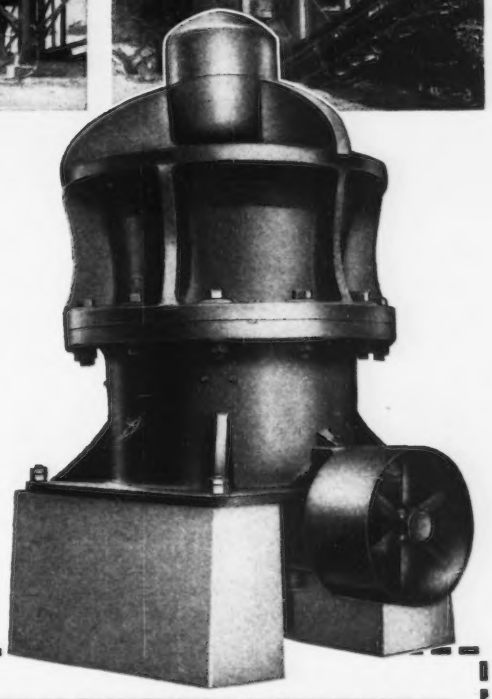


Greater Tonnage...Greater Profits

THE EXCLUSIVE Traylor design features and extra-heavy construction of a TY Reduction Crusher increase your production tonnage by reducing maintenance down-time and boosting hourly out-put with fewer waste fines.

Traylor TY's original, self-tightening bell head and curved concaves apply crushing power with greater efficiency. Increased capacity of each succeeding zone in the crushing chamber permits fine settings to produce greater tonnages with reduced power requirements.

Type TY Traylor Reduction Crushers are of compact design . . . incorporating maximum strength with simplified operation. Six sizes with feed openings from 3″ to 22″. Send for free bulletin 7112.



Traylor

TY REDUCTION CRUSHERS

TRAYLOR ENGINEERING & MANUFACTURING CO.
672 MILL ST., ALLENTOWN, PA.

Send me Bulletin 7112 with complete description, illustrations and specifications on Traylor TY Reduction Crushers.

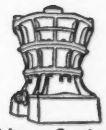
Name: _____

Position: _____

Company: _____

Address: _____ *State:* _____

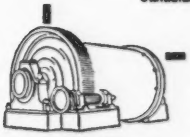
Sales Offices: New York • Chicago • San Francisco
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P.Q.



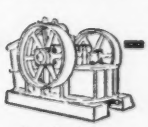
Primary Gyratory Crushers

Rotary Kilns

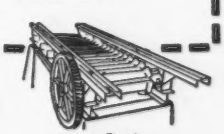
Secondary Gyratory Crushers



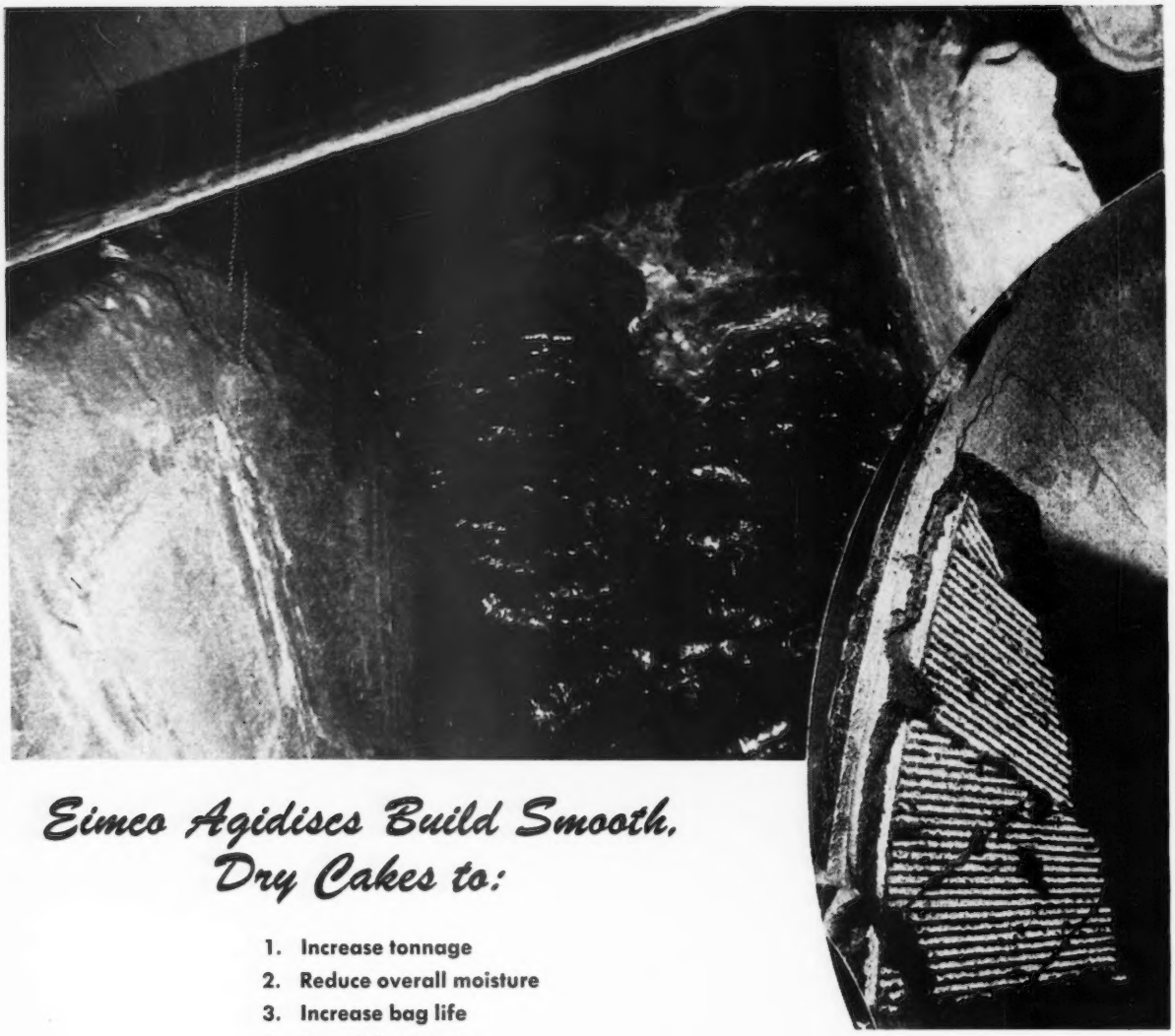
Ball Mills



Jaw Crushers



Apron Feeders



Eimco Agidiscs Build Smooth, Dry Cakes to:

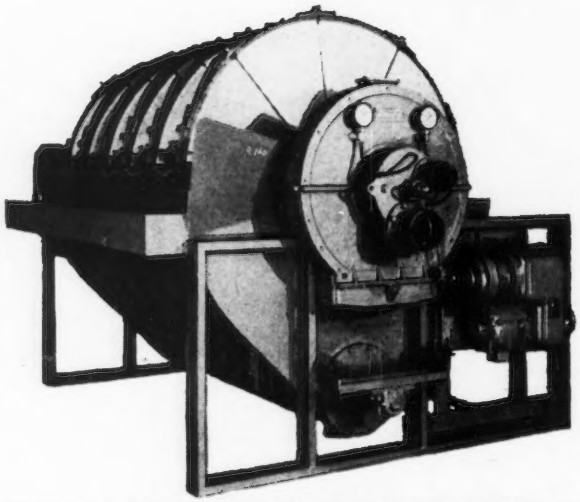
1. Increase tonnage
2. Reduce overall moisture
3. Increase bag life
4. Speed dewatering
5. Increase profits

Fast settling solids in metallurgical slurries are easily kept suspended in solution by the gentle agitating motion of the Eimco Agidisc filter.

This action, in the filter, evenly distributes all particles, regardless of size, so that the entire surface of the disc is covered with a cake of even thickness. Cake thus formed may be dewatered and dried uniformly so that there are no real wet spots or dry spots.

Metallurgical plants using Eimco Agidisc filters are enjoying greater capacity per square foot of filter area per hour (20% better) and lower moisture content in the cake.

Let an Eimco Engineer tell you how the Agidisc works. Whether or not it will make more money for you.



B-57

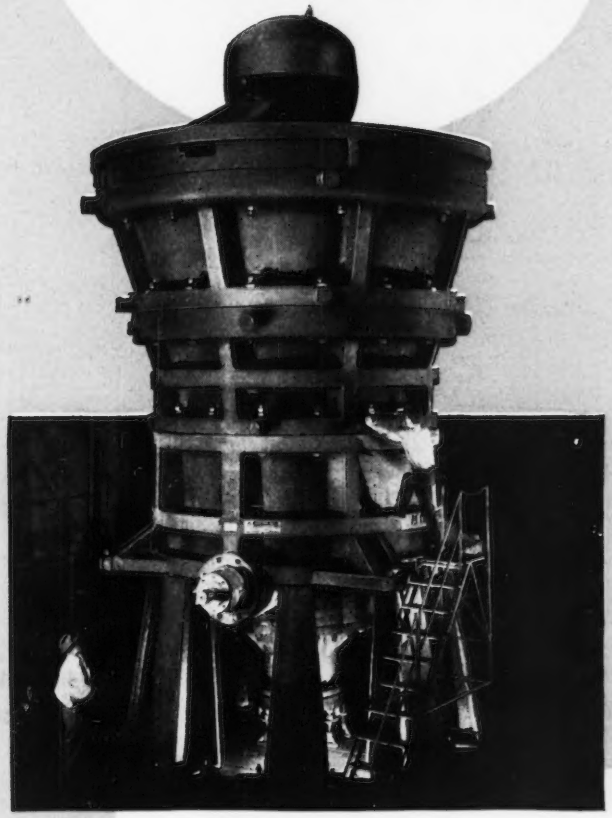
THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Texas Birmingham, Ala. Duluth, Minn. Kellogg, Ida. London, Eng. Paris, France Milan, Italy

SUPERIOR Gyratory CRUSHERS

29 in 3 YEARS!



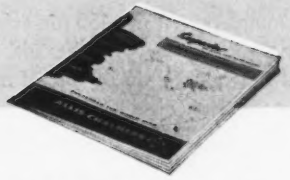
SUPERIOR primary and secondary gyratory crushers have been making a big name for themselves since they were introduced three years ago. Twenty-six are installed and operating... three are under construction now, including a huge 60 x 109 machine — largest crusher the world has ever known.

A policy of simplifying design and controlling quality has made Allis-Chalmers the leading builder of crushers. A continuing policy of *improving* crusher design has greatly extended this leadership.

This vast backlog of crusher application experience — over 75 years of it — is always available to you when you want to make sure of a successful installation. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4319

Superior is an Allis-Chalmers trademark.



NEW 32-Page Book Contains Helpful Crushing Data

Packed with factual "how to" information on figuring hp requirements, impact and compressive strengths.

Step-by-step procedures for estimating gyratory crusher sizes, capacities. Examples are worked out.

Many other valuable facts on gyratory crusher operation . . . application . . . engineering.

It's a book you'll want to have and keep!

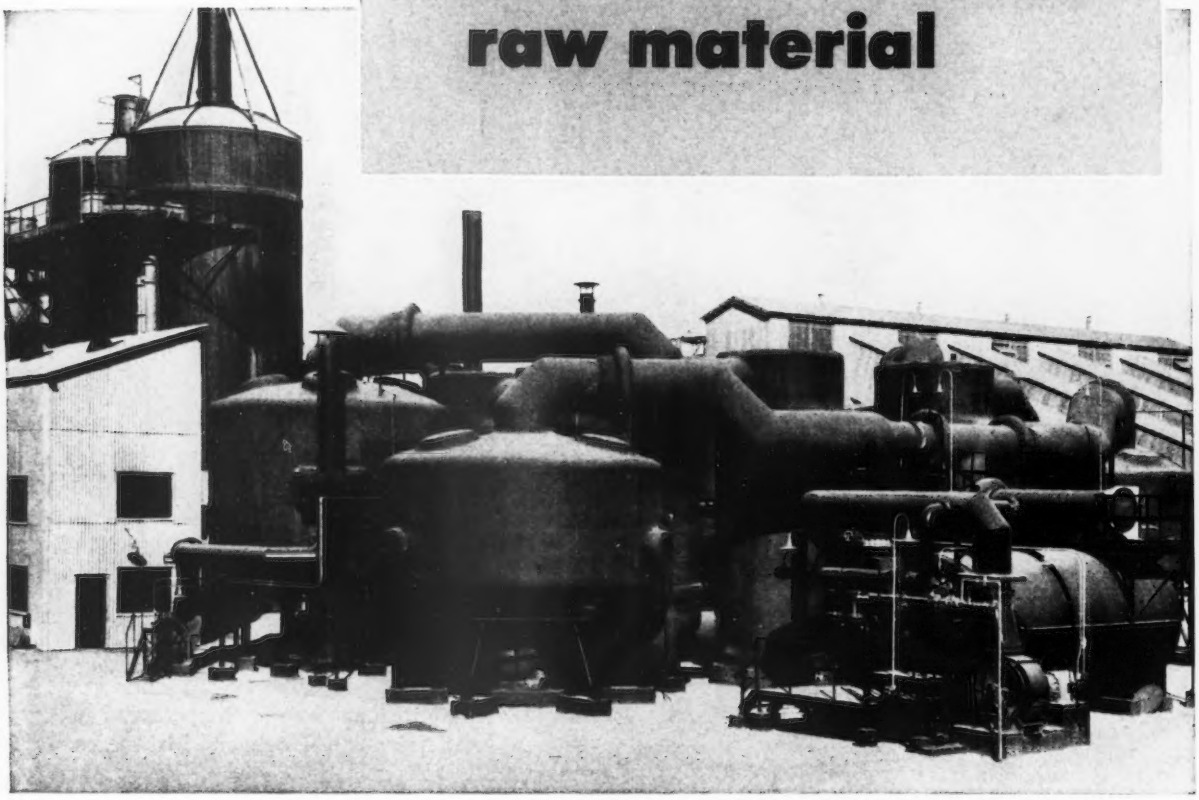
ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.

Another
CHEMICO
achievement

H_2SO_4 from an unusual raw material



By the completion of the 450 ton-acid plant for the Anaconda Copper Company at Weed Heights, Nevada, Chemico has added another unusual raw material to the list of materials from which Chemico plants produce sulfuric acid. Low grade ores containing 25 to 30 per cent uncombined sulfur are roasted in Dorr FluoSolids reactors to produce strong sulfur dioxide which is cooled, purified and processed into fresh acid of high strength. The plant has unusual features of design that permit it to operate at 150 tons or at 500 tons per day capacity with equal efficiency. • If your problem relates to sulfuric acid manufacture, concentration or recovery, Chemico can help you.

Chemico plants also make H_2SO_4 from these sources

- *Hydrogen Sulfide*
- *Sulfide Ores*
- *Sulfur*
- *Waste Smelter Gases*
- *Sulfur Dioxide*
- *Refinery Acid Sludge*
- *Spent Alkylation Acid*
- *Pickling Liquor*

CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

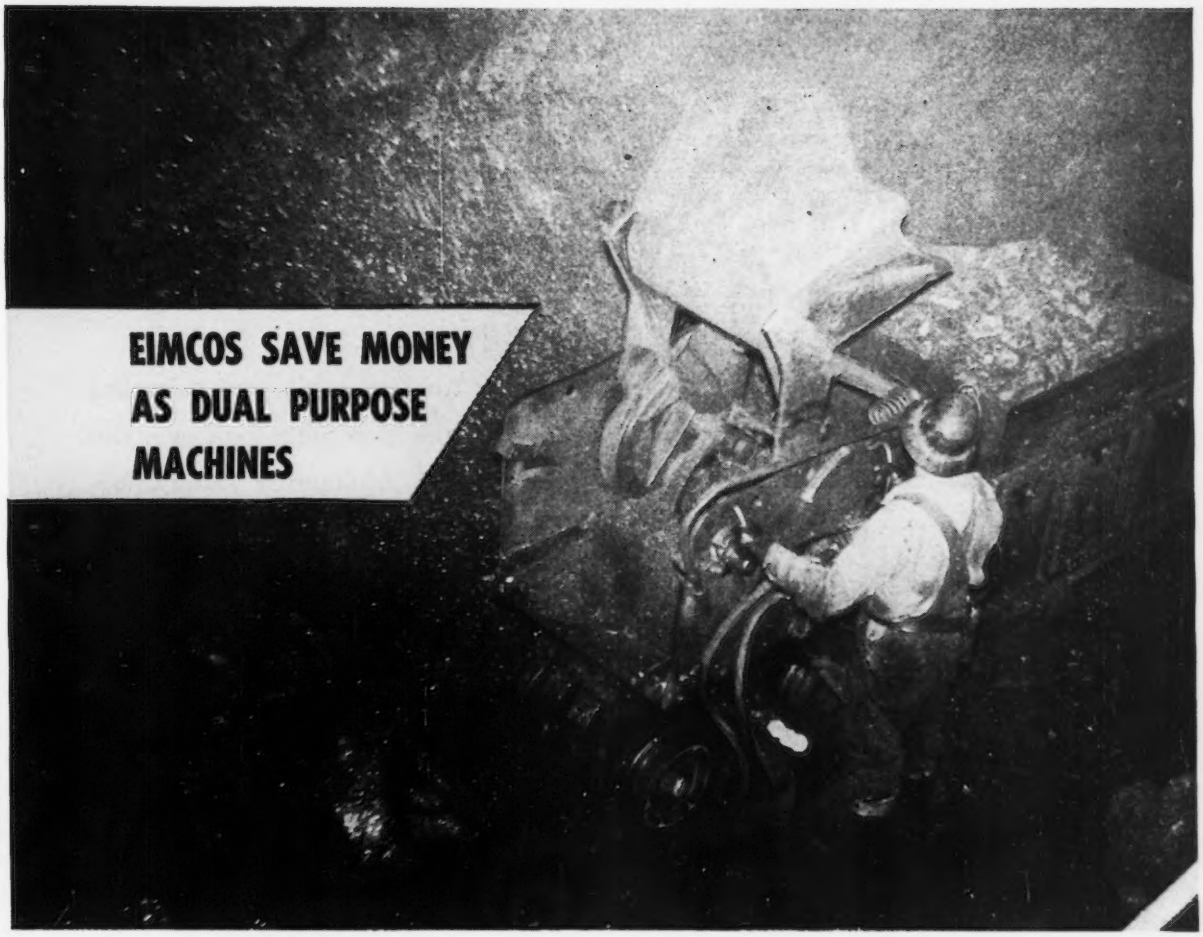
488 MADISON AVENUE, NEW YORK 22, N. Y.

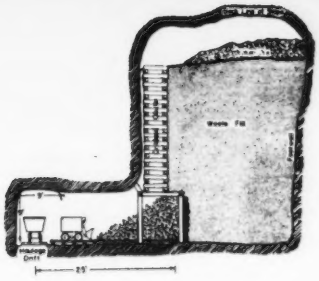
CABLES: CHEMICONST, NEW YORK

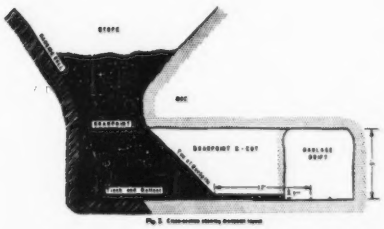
TECHNICAL REPRESENTATIVES: CYANAMID PRODUCTS LTD., LONDON • CHEMICAL CONSTRUCTION (INTER-AMERICAN) LTD., TORONTO • SOUTH AFRICAN CYANAMID (PTY) LTD., JOHANNESBURG

CC 271

Chemico plants are profitable investments







Eimco Loaders are being used for production as well as development work. This dual application for loading equipment has been advanced by numerous large companies who are now mining by drawhole systems including block caving, cut and fill or shrinkage when ore bodies stand more or less upright and even in scraper applications where the ore bodies slope too little to run freely. The idea being to scrape or shoot the ore so that it falls to a station at haulage level where it can be quickly loaded by an Eimco RockerShovel.

These sketches show two examples of methods in use to bring broken ore to haulage level at a minimum cost and provide a place to load mechanically. Many other systems are in use and Eimco Engineers will be glad to advise on layouts that might fit your needs.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Texas Birmingham, Ala. Duluth, Minn. Kellogg, Ida. London, Eng. Paris, France Milan, Italy

You Can't Beat An Eimco

WILFLEY PUMPS — A Vital Factor in Production Continuity

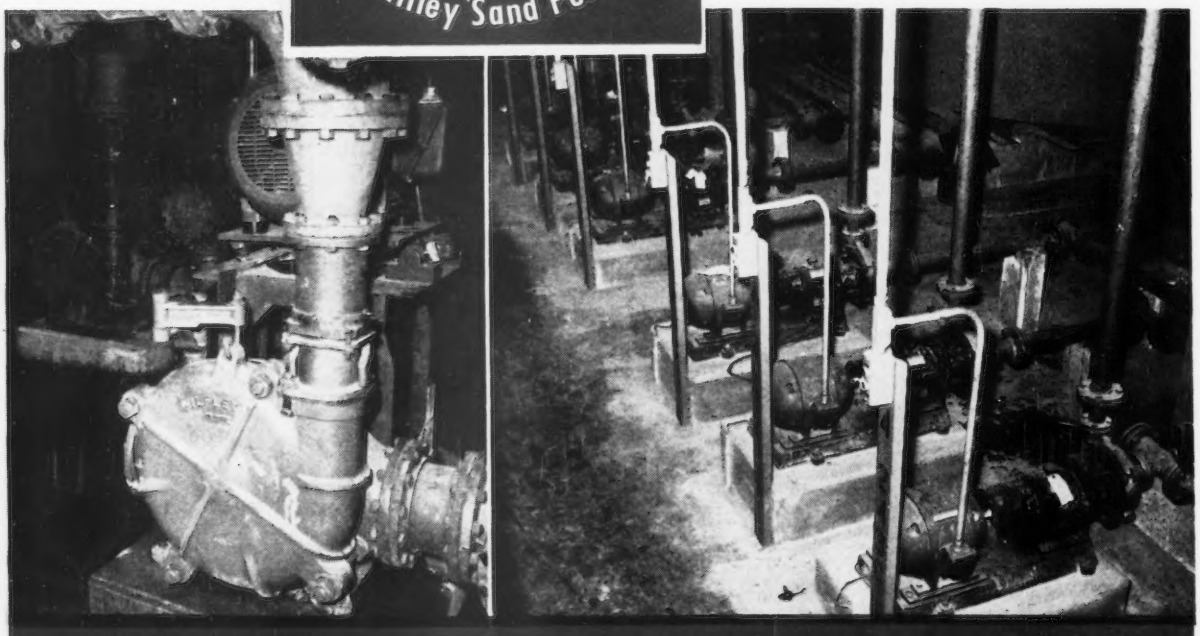
WILFLEY'S remarkable success-record in solving a great variety of pumping problems is well known to operators of mills and chemical plants all over the world. It is a record born of engineering "know-how" plus many years of experience in keeping pace with the changing requirements of modern industry.

- *Individual engineering on every application*
- *Cost-saving efficiency*
- *Reduced power and maintenance costs*
- *Continuous operation without attention*
- *Minimum replacement of parts*
- *Designed for simple installation*
- *Economical pump size for every requirement*

Write or wire for complete details.

Wilfley Acid Pump
"COMPANIONS IN ECONOMICAL OPERATION"
Wilfley Sand Pump

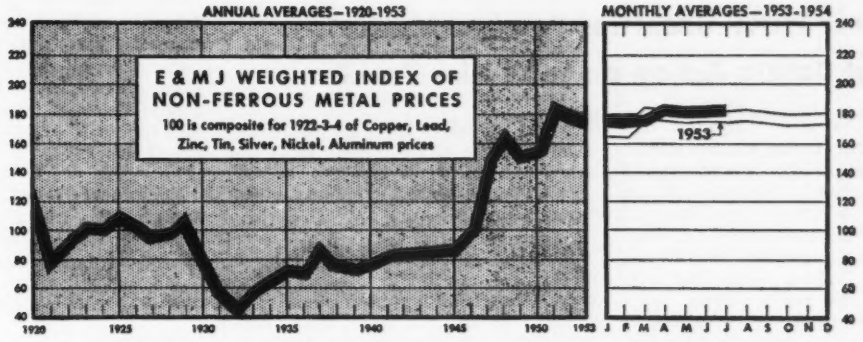
Typical Wilfley installations are shown below. Rubber lining and stainless steel are some of the materials used in Wilfley Sand Pumps and Acid Pumps to provide maximum pumping efficiency.



A. R. WILFLEY & SONS, Inc. • Denver, Colorado, U.S.A. • New York Office: 1775 Broadway, New York City

E&MJ OUTLOOK

PRICES


ANNUAL AVERAGES—1920-1953
E & M J WEIGHTED INDEX OF NON-FERROUS METAL PRICES
100 is composite for 1922-3-4 of Copper, Lead, Zinc, Tin, Silver, Nickel, Aluminum prices
MONTHLY AVERAGES—1953-1954
1953
J F M A M J J A S O N D

MARKETS

July vacations, observed generally at metallurgical plants, slowed the market upturn in metal consumption noted in recent months. Pickup will be slow until steelmaking shows signs of revival.

Slightly higher averages for zinc and tin, and a remarkably stable copper market offset a slightly lower lead average to edge the *E&MJ* metals price index up fractionally from 184.61 for June to 184.68 for July.

Where's all the quicksilver going? It's still a mystery. The Government is buying, or wants to buy more. Some Europeans think that Uncle Sam must be turning it into gold. Others talk of expanding atomic energy uses. Our own guess is that there might be some political or strategic necessity in back of it—but no clear cut answer is now in sight.

●

AT HOME

It seems agreed that the U.S. economy has quit sagging, and is heading either up or sideways, depending on your point of view. The immediate outlook is good, thanks to the ultimate consumer whose spending is reviving just as military spending slackens.

Expect an uproar over Sec. McKay's survey team's suggestion that the U.S. Bureau of Mines get out of the helium business.

Iron ore prices won't go up this year, despite mine wage increases, but prices in next year's contract are bound to go higher.

At least 15 known uranium deposits contain ore reserves in excess of 100,000 tons, and several "greatly exceed" that figure according to AEC.

Output of taconite concentrates from the upper Great Lakes should reach 5-million tons in 1955, 20-million tons by 1970.

●

LABOR

Negotiated settlements, rather than strikes, appear to be in order for the non-ferrous metals industry. Both Alcoa and Phelps-Dodge have worked out agreements with the union. One result—the price of aluminum will go up.

CIO Steelworkers unseated Mine-Mill as the bargaining agent at the Sunshine mine in the Coeur d'Alene district of Idaho. The vote was 262 to 225 in favor of the Steelworkers union. Alleged Communist domination of Mine-Mill leadership was reported to be the principal issue. Previous efforts of the Steelworkers to get a foothold in the Coeur d'Alene district were unsuccessful.

●

ABROAD

The Indo-China cease-fire weakened European non-ferrous metal markets. That's true to form, because metal markets for months have strengthened or weakened as Far Eastern affairs fluctuated.

Krupp and one other West German company are actively interested in iron ore in Labrador. Japan's trading ships and marine engines for Soviet manganese, timber, crude oil, chrome, platinum, asbestos and coal. An unfavorable trade balance forces them to do it.

MARKETS—Trends and Prices

Indo-China Truce Unsettles Foreign Markets—President Defers Action on Lead-Zinc Tariff

CONSUMPTION OF METALS declined moderately during the last month. Use of metals usually slumps during July on widespread observance of the summer vacation period at metallurgical plants. On the announcement of a cease-fire agreement in Indo-China on July 21, prices on the London Metal Exchange weakened. Lower prices abroad failed to influence the producers' quotations in the U.S., but buyers naturally exercised more restraint in making new commitments.

With the Government absorbing good tonnages of copper, lead and zinc for its stockpile, prices in the domestic market for these metals continued unchanged for the month. The *E&MJ* index of nonferrous metal prices advanced from 184.61 in June to 184.68 in July. Monthly averages for zinc and tin were up, with lead off slightly. Quicksilver established a new high. A drive for higher wages by aluminum workers has strengthened the price structure for the light metal.

The tariff decision on lead-zinc was postponed by President Eisenhower. In announcing this unexpected move to the Congressional committees directly concerned with the matter, the President wrote:

"On May 28, 1954, the U.S. Tariff Commission submitted to me recommendations regarding certain alterations in the rate of duty on imports of unmanufactured lead and zinc.

"Since that time the interested departments and agencies of the executive branch have been giving earnest and intensive consideration to these recommendations. This review involves fundamental issues of economics and of public policy. It is essential that whatever action is taken be based on the most comprehensive analysis of all the relevant factors.

"I am, therefore, extending the period of my consideration of the Tariff Commission's report somewhat beyond the customary 60-day period. This letter is to notify you, in conformance with the provisions of the law, why I have not taken action within that period."

Otto Herres, chairman of the National Lead & Zinc Committee, in a protest addressed to the White House, declared that U.S. miners are exceedingly disappointed over the delay. There was a strong feeling in market circles that the Administration is banking on stockpiling of lead and zinc as a means of granting relief to miners. However, should stockpiling fail, other measures may be employed. So far, stockpiling has kept the prices from falling. As July ended the domestic producers got some encouragement from the fact that tariff relief was granted to the watch industry "because of the importance to the industry in national defense."

Stocks of refined copper in the hands of domestic and foreign producers were reduced by 87,513 tons during June. This sharp drop resulted from heavy shipments of Chilean copper to the U.S. stockpile as well as record deliveries to foreign consumers and dealers.

Following is a summary of the statistics of Copper Institute for the first half of 1954 showing refined copper production, deliveries and stocks, figures in tons:

UNITED STATES

	Refined Production	Deliveries	Stocks at End
Jan.	111,553	77,091	108,121
Feb.	103,496	89,017	118,417
March	117,546	95,795	125,759
April	112,617	104,579	124,523
May	108,403	111,005	82,111
June	112,121	106,252	69,181

OUTSIDE UNITED STATES

Jan.	85,100	91,941	280,510
Feb.	70,864	74,457	275,375
March	93,824	93,235	279,804
April	87,747	99,193	273,070
May	95,564	115,197	255,234
June	88,615	130,323	180,651

Mine output of recoverable copper in the United States in the first five months of 1954 totaled 351,034 tons, or an average of 2,325 tons per day, the Bureau of Mines reports. During all of 1953, production totaled 924,600 tons, or an average of 2,533 tons per day.

Copper production is expected to increase over the last half of the year, here as well as abroad, providing there are no work stoppages. A strike has been averted in Chile on settlement of a wage dispute at Chuquicamata. The Northern Rhodesian copper mining companies have announced "with regret" that the negotiations regarding African advancement have ended inconclusively.

Lead purchased for the U.S. stockpile during July probably absorbed another 8,000 tons. This buying, plus a fair demand from consumers, helped to maintain the market on the basis of 14c, N. Y. Stocks of refined lead in the hands of refineries in this country have declined from 109,302 tons at the end of May to 104,626 tons at the end of June.

Zinc for the stockpile bought during July probably exceeds 12,000 tons, the quantity being roughly the same as that for June. This rate of buying for the national reserve is expected to continue for some months to come. Producers hold that the price of 11c for Prime Western is still too low but the quotation cannot be raised at this time because of recent unsettlement in London. Common zinc on the London Metal Exchange declined from £78¾ bid per long ton on July 8 to £74¼ bid as the month ended.

Tin producers and consumers, signatories of the International Tin Agreement, will meet in September to deposit the necessary instruments of ratification. It is believed that only minor difficulties stand in the way of final ratification.

Quicksilver moved up to $290 per flask, N. Y., with the industry as confused as ever over the intentions of the Government. However, the authorities did say that they will not buy quicksilver in the foreign market at higher than $225 per flask, duty paid, landed here. Advices from Italy indicate that an Italo-

Average Prices for July (E&MJ Quotations)

Copper:	
Electrolytic, domestic, refinery	29.700
Electrolytic, export, refinery	29.570
Lead:	
Common, New York	14.000
Common, St. Louis	13.800
Silver and sterling exchange:	
Silver, New York, per oz.	85.250
Silver, London, pence per oz.	72.466
Sterling Exchange, "Checks"	281.774
Zinc:	
Prime Western, East St. Louis	11.000
Prime Western, delivered (g)	11.500
Tin:	
New York Straits	96.577
New York, 99% min. (e)	95.577
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$286.923
Antimony (E&MJ) (d)	31.970
Antimony, bulk, Laredo	28.500
Antimony, in cases, Laredo	29.000
Platinum, refined, per oz.	$84.000
Cadmium (a)	170.000
Cadmium (b)	170.000
Cadmium (c)	170.000
Aluminum, 99% plus, ingot	21.500
Magnesium, ingot	27.000
Nickel (f)	60.000

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.
(a) Cadmium average based on the producers' quotations.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lots, packed in cases f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.
(g) Delivered where freight exceeds 0.5c.

Markets Continued on Page 110

Anglo-American combine is interested in forming a selling agency to control the marketing of the metal. The General Services Administration, Washington, announced that it will purchase up to 200,000 flasks of mercury from U.S. and Mexican producers on the basis of $225 per flask (see page 106).

Tungsten ore in the foreign market firmed up on improved buying outside of this country. There was no improvement in the demand for manganese ore and quotations were largely nominal. Iron ore markets are awaiting an upturn in steel operations which at present are down to around 65% of capacity, against better than 92% a year ago.

"Free" Gold Market

Gold transactions declined 26% in July. Russia sold about 8 tons in Paris, but ceased selling on July 27 owing to the panic in the Paris gold market on devaluation rumors. The Far Eastern market was active, reflecting capital flight from Indo-China to Thailand and Hong Kong. Pick's Currency Report quotes as follows, per fine oz:

	COINS		BARS (12.5 kg.)	
	June 30	July 30	June 30	June 30
NEW YORK, transit	.....	.....	$35.10	$35.10
MANILA	$41.50	$41.75	38.50	38.00
HONG KONG	41.50	41.50	37.50	38.00
BOMBAY	49.10	49.50	47.50	47.00
TANGIER	41.50	41.50	35.05	35.08
BEYROUTH	41.75	41.75	35.25	35.25
PARIS	41.50	41.75	35.85	35.75
BUENOS AIRES	41.50	41.25	39.00	38.50

Note. All prices are computed at the free or black market value of the U. S. dollar in the local markets.

Major Metals

U. S. DAILY AND AVERAGE PRICES

July 1954	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc Delivered (f)	Zinc East St. Louis
1	29.700	29.625	96.500	14.000	13.800	11.500	11.000
2	29.700	29.625	96.375	14.000	13.800	11.500	11.000
3	No Market	29.600	96.375	14.000	13.800	11.500	11.000
5	Holiday	29.625	Holiday	Holiday	Holiday	Holiday	Holiday
6	29.700	29.675	96.750	14.000	13.800	11.500	11.000
7	29.700	29.600	96.750	14.000	13.800	11.500	11.000
8	29.700	29.700	96.375	14.000	13.800	11.500	11.000
9	29.700	29.600	96.500	14.000	13.800	11.500	11.000
10	No Market	29.550	96.500	14.000	13.800	11.500	11.000
12	29.700	29.575	96.500	14.000	13.800	11.500	11.000
13	29.700	29.775	96.500	14.000	13.800	11.500	11.000
14	29.700	29.675	96.750	14.000	13.800	11.500	11.000
15	29.700	29.550	97.250	14.000	13.800	11.500	11.000
16	29.700	29.650	97.750	14.000	13.800	11.500	11.000
17	No Market	29.575	97.750	14.000	13.800	11.500	11.000
19	29.700	29.625	97.750	14.000	13.800	11.500	11.000
20	29.700	29.550	96.625	14.000	13.800	11.500	11.000
21	29.700	29.525	95.750	14.000	13.800	11.500	11.000
22	29.700	29.375	95.750	14.000	13.800	11.500	11.000
23	29.700	29.350	96.750	14.000	13.800	11.500	11.000
24	No Market	29.575	96.750	14.000	13.800	11.500	11.000
26	29.700	29.475	97.000	14.000	13.800	11.500	11.000
27	29.700	29.650	96.125	14.000	13.800	11.500	11.000
28	29.700	29.425	96.125	14.000	13.800	11.500	11.000
29	29.700	29.500	96.000	14.000	13.800	11.500	11.000
30	29.700	29.375	95.875	14.000	13.800	11.500	11.000
31	No Market	29.575	95.875	14.000	13.800	11.500	11.000
AVERAGES FOR MONTH							
July	29.700	29.570	96.577	14.000	13.800	11.500	11.000
AVERAGES FOR WEEK							
July							
7	29.700	29.625	96.550	14.000	13.800	11.500	11.000
14	29.700	29.646	96.521	14.000	13.800	11.500	11.000
21	29.700	29.579	97.146	14.000	13.800	11.500	11.000
28	29.700	29.475	96.417	14.000	13.800	11.500	11.000
CALENDAR WEEK AVERAGES							
July							
3	29.700	29.608	96.375	14.000	13.800	11.500	11.000
10	29.700	29.625	96.575	14.000	13.800	11.500	11.000
17	29.700	29.633	97.083	14.000	13.800	11.500	11.000
24	29.700	29.500	96.563	14.000	13.800	11.500	11.000
31	29.700	29.500	96.167	14.000	13.800	11.500	11.000

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

July 1954	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	281.8750	85.250	73.125d.	248s. 11d.	$35.00
2	281.8750	85.250	73.125d.	248s. 11d.	35.00
3	(e)	(e)	(e)	(e)	35.00
5	Holiday	Holiday	73.125d.	248s. 11d.	Holiday
6	281.8125	85.250	73.125d.	248s. 11d.	35.00
7	281.7500	85.250	73.125d.	248s. 11⅛d.	35.00
8	281.7500	85.250	73.125d.	249s. 1d.	35.00
9	281.8125	85.250	72.750d.	249s. 0d.	35.00
10	(e)	(e)	(e)	(e)	35.00
12	281.8125	85.250	72.250d.	248s. 11⅛d.	35.00
13	281.8125	85.250	72.500d.	248s. 11d.	35.00
14	281.8125	85.250	72.500d.	248s. 11⅛d.	35.00
15	281.7500	85.250	72.500d.	248s. 11⅛d.	35.00
16	281.7500	85.250	72.500d.	248s. 11⅛d.	35.00
17	(e)	(e)	(e)	(e)	35.00
19	281.7500	85.250	72.250d.	248s. 11d.	35.00
20	281.7500	85.250	72.250d.	248s. 11⅛d.	35.00
21	281.7500	85.250	72.000d.	248s. 11⅛d.	35.00
22	281.7500	85.250	72.000d.	249s. ⅛d.	35.00
23	281.7500	85.250	72.000d.	249s. ⅛d.	35.00
24	(e)	(e)	(e)	(e)	35.00
26	281.7500	85.250	72.000d.	249s. ⅛d.	35.00
27	281.7500	85.250	72.000d.	249s. ⅛d.	35.00
28	281.7500	85.250	72.000d.	249s. 1d.	35.00
29	281.6875	85.250	72.000d.	249s. 1d.	35.00
30	281.7500	85.250	72.000d.	249s. 1⅛d.	35.00
31	(e)	(e)	(e)	(e)	35.00
AVERAGES FOR MONTH					
July	281.774	85.250	72.466	—	35.00
AVERAGES FOR WEEK					
July					
7	281.828	85.250	—	—	—
14	281.800	85.250	—	—	—
21	281.750	85.250	—	—	—
28	281.750	85.250	—	—	—

Calendar Week Averages, New York Silver: July 3rd, 85.250; 10th, 85.250; 17th, 85.250; 24th, 85.250; 31st, 85.250.

(e) No market (Saturday).

Correction: Export or foreign copper—Average for *E&MJ* week ended June 30th, 29.600c; average for calendar week ended June 26th, 29.571c.

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c per pound, the average differential for delivery charges.

(b) Our "export" quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West, effective Jan. 1, 1951, commanded a premium of 1.35c per pound over the current market for Prime Western; Special High Grade 1.50c.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The Daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one quarter-cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5 per troy ounce 1000 fine, effective July 1, 1946. London silver is pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines . . .

G. P. Lutjen

Don't know how you spent the month of June, but we spent it hand painting neckties. You may recall that we published in June a sentence we had found ending in five prepositions. It revolved around a boy in bed upstairs who asked when his mother arrived with a book, "What did you bring that book I don't want to be read *to out of up for*?"

We were so impressed with this masterpiece of grammatical rebellion that we impulsively offered a genuine hand-painted necktie to anyone who came up with a sentence ending in more prepositions. We've been up to our ears in the necktie business ever since. It's not so much the drain on our artistic resources that we mind, it's the nasty suspicion that we've been taken. For instance, here are a couple of typical replies.

"It is quite an accomplishment for someone to compose a sentence that ends with *to out of up for.* Would appreciate a maroon background on my tie." F. W. Bloecher, Jr., New York, N. Y.

"I accept your challenge. . . . How's this? Quote, 'Among the more commonly used prepositions are the following: in, around, under, over, to, out, of, for, at, on, by.' I am also fresh out of genuine hand-painted ties." John H. Sullivan, Bishop, Calif.

As the fellow who fell in the sewer said, "This has been quite an experience but I haven't been able to figure out how I'm going to use it."

Those holding tickets for the first flight to the moon will be happy to hear that a Navy Viking-10 rocket launched at White Sands reached a height of 136 mi above the earth and achieved a maximum speed of 4000 mph. The Viking is 42 ft long, weighs 72½ tons, and is powered by an alcohol-liquid oxygen engine producing a thrust of 20,000 lb. Climb aboard, space cadets, there's only 221,327 mi to go!

Quite by coincidence this issue turned out to be a tribute to Anaconda Copper Mining Co. We don't intend to wax lyric about it, but any tribute forthcoming is well deserved. Yerington, whose story begins on p 72, is one of the most notable new copper projects to come down the pike in this decade. As one of the nation's leading producers, a copper venture is a natural for Anaconda, and, as you will read, they have done the fine job which is expected of them.

Even more exciting to many observers is Anaconda's role in the uranium picture. ACM was one of the first big companies to take the leap. That they persisted in the face of serious mining and technical problems in a field where others feared to tread is indicative of a healthy self-confidence. That they succeeded so well is a tribute to the competence of the company's engineers, geologists and management.

We've waxed lyricer than we intended, but on p 96 you can read the story for yourself—that is, all that can be said this side of security.

Some 60,000 are expected at this year's Goodyear Tire & Rubber Co.'s frolic being held despite plant strikes. Unless they're counting ants, this is probably the world's record for picnics.

Doing our bit for the prospector, we pass along this word from American Cyanamid's *Dyelines and Bylines* "One way to discourage mosquitos during these hot summer months is to choose your colors carefully. Research findings indicate that dark colors generally attract mosquitoes, light colors repel them. Especially repugnant to them are yellow, white and orange, while dark blue, red and brown attract them."

When the handbook people get around to putting out a 4th edition of Peele, we want them to know that we are standing by with a couple of contributions for Section 10. We have just heard of two new mining methods that we wouldn't hesitate to call the most revolutionary developments in the recent history of the industry.

One method was called to our attention by George B. Holderer, a mining engineer with the Minerals, Materials and Fuels Subcommittee of the Senate Committee on Interior and Insular Affairs. It seems that a black substance found on the bellies of crabs caught at the mouth of the Naas River in British Columbia, made them almost unsaleable. The unhappy fishermen took the offending crabs to the Pacific Fisheries experimental station where it was discovered that the black substance ran 24% manganese, and it shouldn't be long before some enterprising individual is breeding crabs for manganese mining.

In Peele, we would classify this ingenious mining system as Sub-Level Crustacean. Has the advantage of relatively low labor costs unless, of course, the crabs become organized—presumably by the Minnow, Mullet and Smelt Workers. Who else?

Our second contribution to Peele will undoubtedly gain fame as the Carillo Sluicing System. Mr. Carillo keeps his cows in a pasture that contains a salt lick which the cows find uncommonly tasty. One day, wanting some fresh meat, Mr. Carillo killed a beef. He emptied the stomach in order to make a fine Mexican delicacy known as *menudo,* which enjoys a reputation as a cure for hangovers. He found the spongy lining of the stomach filled with a hard substance, which upon closer examination, turned out to be gold. With reasonably careful crushing and washing, he extracted 4 oz. The salt in the earth had apparently chloridized the gold and the stomach of the cow had acted like a coarse blanket in a sluice box.

Mr. Carillo wasted no time in turning the sheep in with the cows, and now, according to the USBM safety bulletin, our authority for this morsel, whenever he needs a little cash, he simply kills a beef or a mutton, depending on his financial requirements.

In our professional opinion, a miner can make money employing the Carillo Sluicing System, but it takes a lot of guts.

Got somebody you want to drive crazy? Send him a telegram saying, "Ignore previous wire."

ENGINEERING AND MINING JOURNAL

AUGUST 1954

Another "A" For Anaconda

ALTHOUGH ONE HAS come to expect extraordinary accomplishments from the Anaconda staff, it still must amaze one to learn the full measure of the achievement represented by the Yerington Project at Weed Heights, Nevada.

Described in this issue in an article beginning on p 72, the Yerington Project rates a top rank in anyone's system of grading.

Brought in two years from an empty expanse of sagebrush to a production of over 5-million lb of copper a month, the Yerington Project is not unusual alone for its speedy development. In its method of coordinating mine and leaching plant, in its heavy dependence on trucks, in its means of applying sulphuric acid for leaching, in its use of iron cementation on so large a scale, in all these things and more, Anaconda's new project at Weed Heights is extraordinary, and in certain aspects, unique.

Details on these various aspects of the Yerington Project appear in following pages. We should like to take this opportunity to point out, however, that there is a further aspect of the development of the property that is not only unusual but informative as well. We mean informative for any one who may have as yet failed to see how a moderate amount of government cooperation with mining companies can result in new mines, new jobs, new tax-paying income and greater mineral output.

Under existing conditions of mining costs, tax burdens, and market outlook, Anaconda would not have been justified in going ahead with the Yerington Project. The decision to launch the project was taken when the Government offered the inducement of rapid amortization of the investment for tax purposes and of a floor-price contract for a specified part of Yerington's output, if it could not be sold in the open market at that price.

These inducements by no means take all the risk out of the venture, nor do they destroy the incentive to keep the Yerington operation at top-notch efficiency. These acts of Government simply transfer a part of the risk of mining to the Government, but control and ownership and the possibility of making a profit by prudent management remain with the company.

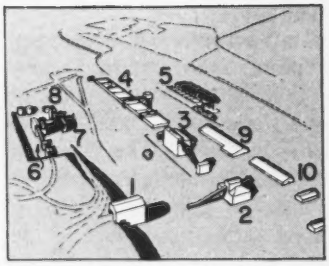
Lately, Walter Reuther and the CIO unions have joined the drive for direct subsidies to uneconomic and marginal mines, as preferable to any other form of government aid to mining. Being intelligent men, they are able to think this matter through as well as anyone, and their stand can only mean that they prefer to deal with government bureaus in fixing wages and working conditions (through adjustment of subsidies) rather than with the managements of companies still privately owned.

To anyone who does not become deaf, dumb, and blind when the word "profit" is mentioned, it must be clear that, wherever it is feasible, some system of tax, or purchase-contract, incentive is vastly superior to direct subsidies as a means of encouraging mining. We simply offer the Yerington Project as a case in point, and we also ask your indulgence for delivering a lecture along with the bouquet to the men who developed the project.

To all the staff members of Anaconda, at Weed Heights and in New York, who so generously gave their time and knowledge to make this article possible, and in particular to Bert Millar, general manager, whose praise and whose criticism we prize equally and greatly, go our thanks and our congratulations on a job well done.

1. AT FIRST you'd see gravel dumps (right), Weed Heights (left), mine and plant (center right).

2. CLOSER LOOK shows homes, swimming pool, town buildings with mine beyond and town of Yerington in distance.



The Units of Anaconda's Copper Leaching Plant

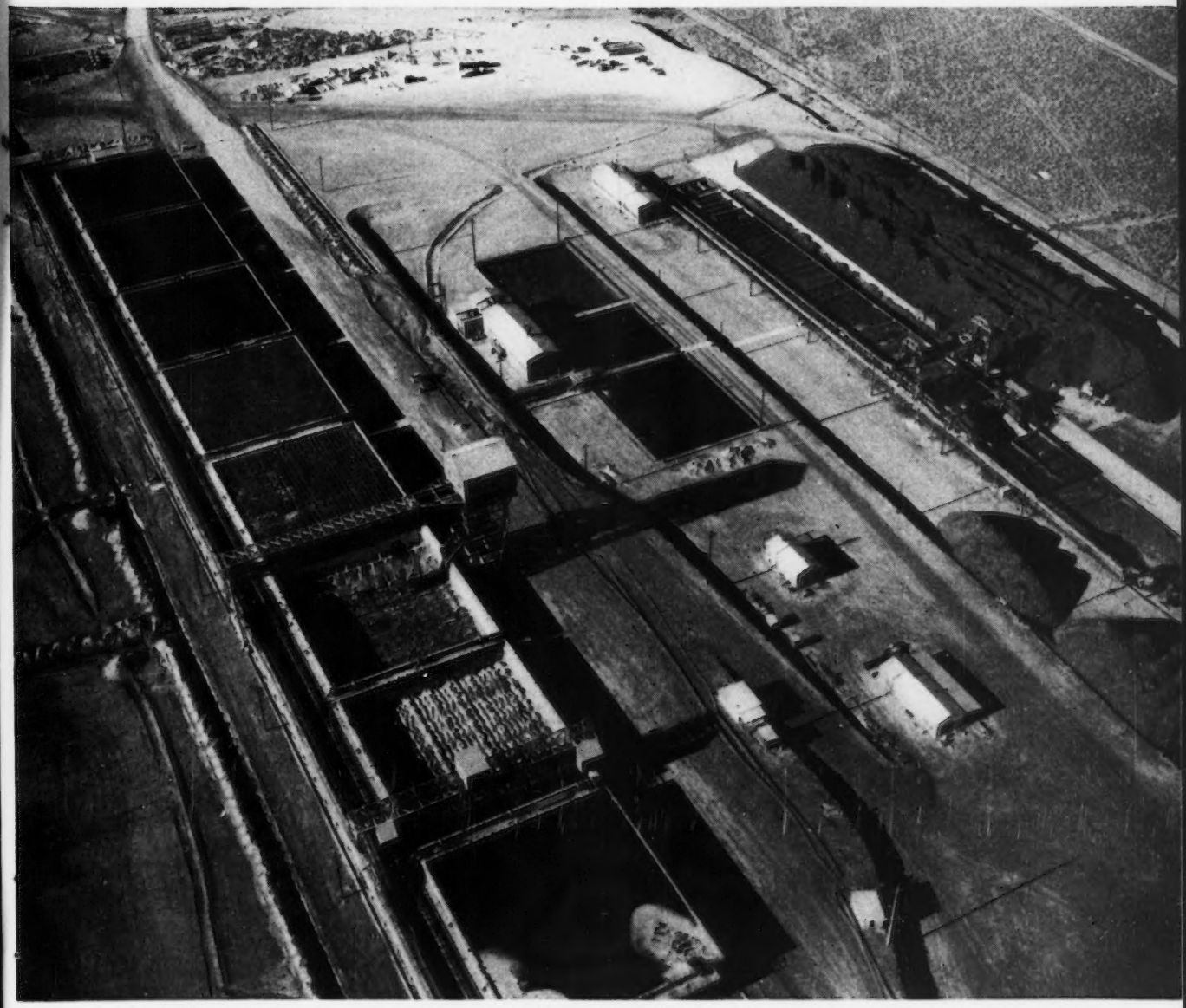
1. Primary crusher.
2. Coarse ore storage.
3. Secondary crushers.
4. Leaching vats.
5. Cementation launders and tin can storage.
6. Sulphur ore crushing and grinding plants.
7. FluoSolids reactors.
8. Sulphuric acid plant.
9. Garage.
10. Warehouse, shops, offices.

3. STILL CLOSER LOOK shows entire plant, which is now producing at rate of 5-million lb of copper monthly. Drawing at left identifies units.

WEED HEIGHTS

If you were to fly to Anaconda's new copper project in Nevada, here's what you'd see.

For complete details, see following pages ➡



4. AS CLOSE A LOOK as we dare provide, shows leaching sequence, with tank 1 leaching, tank 2 being charged, tank 3 being unloaded, tank 4 draining, etc. Note pile of cans at right. Complete article on the Yerington project begins next page.

THIS IS THE WAY a pit should look, with trucks coming in time to keep the shovel busy, with drilling well along, and with broken rock dozed well up to the toe. As a result, Yerington's output averages better than 7000 tons per shovel shift.

(For aerial view of the project, see p 72.)

Anaconda's Nevada Project-

TRUCKS, like Yerington's Darts lined up for Sunday, are backbone of project.

R. H. RAMSEY, Editor

AS A GLANCE at the tabulation at right will show you, Anaconda's Yerington project has something to offer any student of mining adminstration, no matter where his chief interests may lie.

Yerington's problems of technology, logistics, and economics have been tough enough, wide enough in scope, and solved ingeniously enough, to capture the interest of anyone at all interested in mineral industry progress.

This is the story of those problems and how they are being solved.

The oxide copper orebody near Yerington, Nev., has been known for years. It was explored tentatively by several companies at various times, but not until 1941, when Anaconda took a lease on option on the property, did anyone show real interest in it.

Recognizing that its limited reserves and low grade would not justify large capital investment in normal

Why Anaconda's Yerington Project At Weed Heights Is Unusual

1. It began from the sagebrush up. No shops, no materials, were available at the site.
2. It was supplied, and now operates, entirely by truck. The nearest rail connection is 12 mi. away.
3. It is the largest copper mine ever planned from the start to recover all its output by iron cementation and to ship precipitates so far for treatment. (800 mi. to Anaconda, Montana).
4. It uses a new method of manufacturing acid for leaching.
5. Its method of agglomerating ore fed to the leaching vats is unique and most effective.
6. It is a balanced job, from shovel to precipitation launders. Mine and plant planning are therefore unusually thorough and well-coordinated.

New Approach To Copper Mining

circumstances, Anaconda began intensive exploration and development only in 1942, with the aim of adding to wartime supply of copper.

The WPB decided, however, that Yerington's output could not be ready in time to justify diverting scarce materials to its development. The project was shelved, although on instructions from Clyde Weed, Anaconda's vice-president in charge of operations, exploration and preliminary studies for development went on.

Between 1942 and 1945, a program of drilling, shaft-sinking and drifting went on under the direction of Alex. M. McDonald, Anaconda geologist. Churn drill holes on 200-ft centers were spread across the orebody. A 400-ft shaft was sunk into the orebody, and levels were run out into oxide and sulphide zones. Raises were driven up some of the drill holes providing bulk samples as a check on the drilling. Carload samples were taken to provide ore for metallurgical testing.

This exploration campaign showed between 35-and 40-million tons of oxide copper ore averaging between 0.90 and 0.95% copper. Below it, there was indicated at least 15-million tons of sulphide ore of about the same grade.

Tough Mining Problem

The orebody can be called a porphyry copper, but it is certainly spottier than most. It has zones as high as 4-or 5% copper, and near them zones almost barren. This, coupled with the orebody's relatively small size, greatly complicates mining.

The basement rock is a granodiorite. It is intruded by a quartz monzonite porphyry. Ore is found in both, but most of the orebody is within the quartz monzonite.

Chrysocolla is the chief copper mineral. Most of it is well-disseminated, but the remainder occurs in seams and fractures. The zone of secondary enrichment is unusually small, only a minor amount of chalcocite having been found below the oxide zone. In the sulphide zone, chalcopyrite is the principal copper mineral. The orebody had a heavy gravel cover, running up to 200 ft thick at some points.

Project Was Ready

As a result of this exploration, the project was ready for development when the Korean "police action" renewed heavy demands for copper.

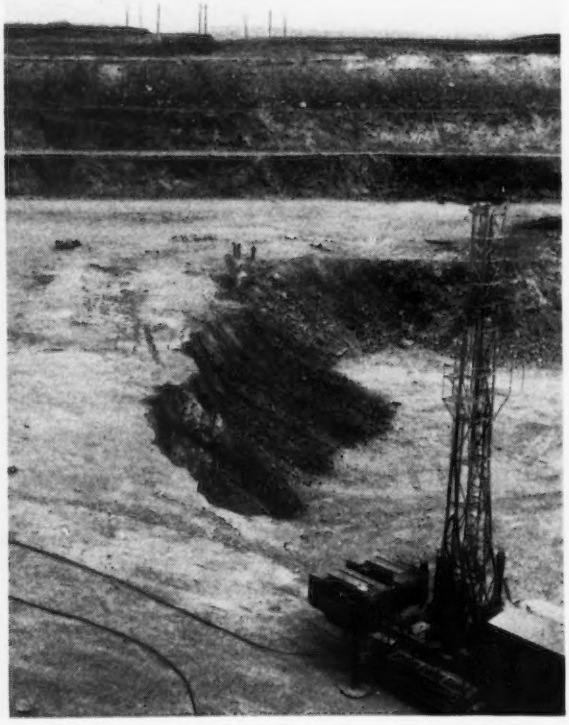
This time the goverment wanted the ACM Nevada property brought into production, but by decision of C. F. Kelley, Anaconda's chairman of the board, there was to be no Government money in the project.

However, because of the orebody's definite limitations as an investment, the Government offered a floor-price contract and accelerated amortization as inducements to Anaconda to provide the necessary capital.

The contract, concluded in late 1951, provides that the Government will buy at not less than 25½c per lb any copper that Anaconda is unable to sell to industry at that minimum price, up to a maximum of 256-million lb during the first 6 years of operation.

DRILLING is done by Joy Champion rotary rig. Usually there are three rows of 7⅞-in. holes drilled 3 to 5 ft below grade in these 25-ft benches. Holes are spaced on 25-ft centers, with rows 20 ft apart. First row is 25 ft back from toe.

BLASTING is done with 60% special gelatin primers in the hole bottoms, with up to 4 cases of quarry powder on top.



DIGGING is easy because rock shatters well. Note black puff in blast photo above left, where TNT breaks a hard rib.

Anaconda was also issued Certificates of Necessity permitting it to amortize for income tax purposes over a 5-yr period 75% of the amortizable portion of the approximate $34-million expenditure required by the project.

When the decision was made in November 1951 to go ahead, A. E. Millar was put in charge of the project, and Clyde Weed gave him pretty much of a free hand in developing it.

Millar In Charge

Bert Millar has been with Anaconda since 1924. He is a graduate of the Mining Branch of the University of Texas, and has devoted most of his career to open pit mining. He was in Chuquicamata for 15 years, where he was in charge of engineering and development, and he served as pit development superintendent at Cananea. (See *E&MJ*, December 1944,

Table I. Summary of mine operating data for month of May 1954, Yerington Project, Weed Heights, Nev.

	Month of May	Year to Date	Total Acc.
TOTAL MATERIAL REMOVED FROM PIT			
Note: These tonnages include the following amounts of ore which have been delivered to the plant.	750,350	4,177,575	24,388,192
From benches	308,575	1,410,850	1,742,400
From stockpile	.....	.....	.....
Average assay, % Cu	0.88	0.95	0.95
SHOVELS			
Total tonnage loaded	750,350	4,177,575	24,265,274
Operating shifts	105.63	600.63	3,412.76
Tons per operating shift	7,104	6,955	7,110
HAULAGE TRUCKS			
Total tons hauled	750,350	4,177,575	24,265,274
Operating Shifts	872	4,905	23,642.25
Tons per operating shift	860	852	1,026
ROTARY DRILL			
Blast hole drilling			
Total footage drilled	16,160	73,436	214,507
Footage lost	455	1,478	4,054
Ft per hr operated	48.82	48.94	50.54
Ft per op shift	297.88	277.90	264.54
Operating shifts	54.25	264.25	810.88
Prospect drilling			
Total footage drilled	853	20,623	54,438
Ft per hr operated	47.39	51.56	45.56
Ft per op shift	284.33	278.69	288.06
Operating shifts	3	74	238.7
Feet per bit, total accumulative	.....	.....	3,308
CHURN DRILL			
Blast hole drilling			
Total footage drilled	.....	1,380	16,136
Footage lost	.....	.....	1,377
Footage blasted	.....	1,380	14,759
Ft per op shift	.....	60	53.52
Operating shifts	.....	23	301.5
Prospect drilling			
Total footage drilled	1,850	9,778	50,375
Ft per op shift	33.33	37.72	39.63
Operating shifts	55.50	259.50	1,271.19
BLASTING			
Tons broken by explosives	594,200	3,325,725	12,482,709
Pounds of powder used	82,600	419,425	1,489,822.50
Tons per lb of powder	7.19	7.93	8.39
Footage available at beginning of month	10,507	.....	.....
Footage available during month	15,705	.....	.....
Footage blasted	14,090	.....	.....
Footage on hand at end of month	12,122	.....	.....
WATER WELLS			
Footage drilled	35	390	1,725
Footage lost	.....	.....	650
Footage available	35	390	1,075
Cu ft water pumped	13,815,000	65,882,000	258,436,000
Cu ft water consumed	11,593,000	.....	.....
Cu ft water to Walker River	2,222,000	.....	.....

"How Cananea Develops Newest Porphyry Copper.")

He became open pit mining consultant for Anaconda in 1946, with headquarters at Inspiration. In 1948 he went to New York and, among other activities, began planning to mine the Yerington orebody.

Nothing But Sagebrush

When Mr. and Mrs. Millar moved into one of the cottages in Yerington's Ranch House Motel in November 1951, there was nothing on the hillsides out west of town but sagebrush and the scratches left by the earlier exploration activities of Anaconda.

It is hard to believe, but is nonetheless a matter of record, that the first shovel entered the pit area and began digging in June 1952. The first cement copper left the property on Nov. 10, 1953.

Thus, in two years from the time the Millars settled in Yerington an 11,000-ton mine and plant were started, offices, shops, warehouses were built and equipped, a town of over 250 homes was planned and built, and an enormously complex job of planning and equipment assembly was successfully carried out.

Drive up through Weed Heights in the evening and you'll see men trimming and watering green lawns, women talking across back fences on which there are roses climbing, children chasing each other up and down driveways. Far away you hear the constant roar of trucks climbing out of the pit, or gunning away from the crusher pocket.

It's hard to believe that so short a time ago on this spot there was nothing but sagebrush and a few men with energy and a set of plans.

Mine Planning Vital

Planning, after all, is still the key to the whole Yerington operation. Because the orebody is so variable in grade, mining must be carefully controlled or impossible burdens will be laid on the leaching department.

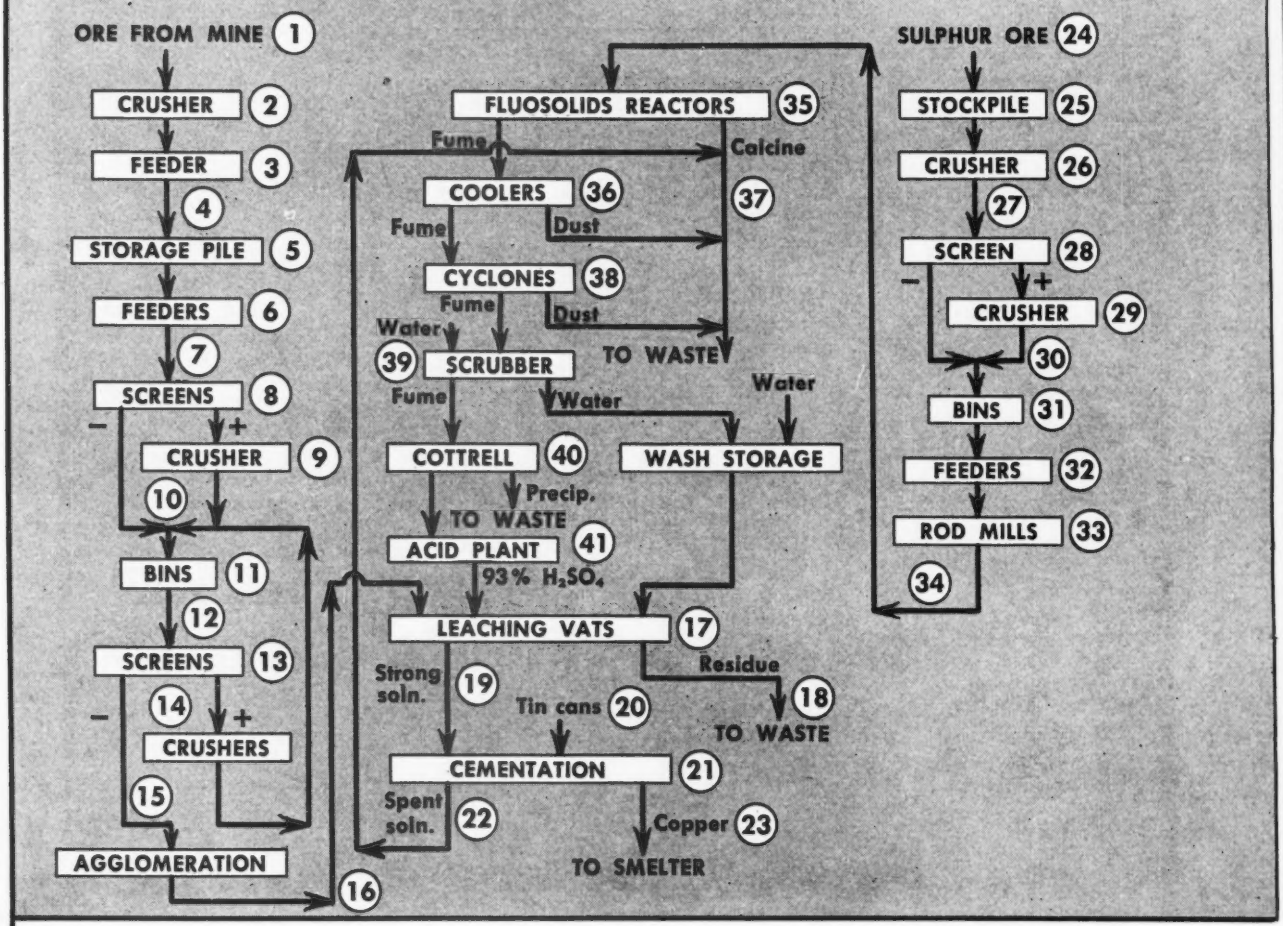
In fact the entire mining, acid preparation, leaching and cementation flowsheet must be run as one close-knit coordinated unit if serious trouble is to be avoided.

Planning, therefore, must start with the mine. The mining engineering staff, under the direction of Don Gill, keeps up three sets of plans: one is a forecast of mining operations one month ahead; the second is a 6-months' forecast; the third is a long-range plan covering pit operations years away. All of these undergo constant revision; the over-all mine plan, for example, beginning as Plan A-1, has had four major revisions and numerous minor ones, and is now up to Plan E-12.

However, the important day-to-day job of the engineering department is to schedule where and how much each shovel will dig and where the material will be sent. This is unheard of in most pit operations, but the nature of the Yerington orebody requires it.

For example, the shovels must dig a "balanced diet" of high grade ore and low grade so that the weighted average grade of ore to the plant will be about 0.9% Cu. However, this must be done in such a way that the

ANACONDA COPPER MINING CO.
WEED HEIGHTS, NEVADA



LEGEND

1. Mining at rate of 13,000 tons ore, 27,000 tons waste daily. Mine uses Joy Champion blast hole drill, four P&H 5 yd shovels, thirty 25-ton Dart end-dump trucks. See Table I for mine output data.
2. Trucks dump over 6-in. grizzly into 54-in. Traylor gyratory set to 5-in. discharge. Crusher is driven by 400-hp Westinghouse motor; Ducon dust collecting system is used.
3. Pan feeder, Link-Belt, 60-in.
4. Belt conveyor, 48-in, 475 fpm. (All belt conveyors from Stephens-Adamson Mfg. Co.)
5. Coarse ore storage; 23,000 tons total storage, 11,000 tons "live" storage. (See drawing)
6. Four pan feeders, Link-Belt, 48-in.
7. Belt conveyor, 48-in., 350 fpm.
8. Two 5x12-ft Ty-Rock single-deck screens, 1½-in.
9. Symons 7-ft Standard cone crusher, plus one spare.
10. Two 42-in. belt conveyors in series, 550 fpm.
11. Three 250-ton steel bins.
12. Three Link-Belt pan feeders, 48-in.
13. Six 5x12-ft Tyler double-deck screens, ¾-in.and ⅜-in.
14. Three 7-ft Shorthead Symons cone crushers, plus one spare.
15. Belt conveyor, 36-in., 550 fpm. Minus ⅜-in. material drops on this belt through chutes from each of six screens. Water sprays between chutes wet each succeeding layer.
16. Agglomeration of material is accomplished through wetting each layer, then tumbling ore by stationary tripper and a sampling tower before it goes to 36-in. belt, 550 fpm, 1300 ft long, leading to loading bridge over leaching vats.
17. Eight leaching vats, each reinforced concrete, 120x135x20-ft. Loading bridge, Heyl & Patterson, can load 1500 tph. Ore is deposited by tripper in two 10-ft thicknesses over one-third of vat area at a time.
18. Unloading bridge, Heyl & Patterson, uses 8-ton clamshell bucket; unloads at 900 tph into 120-ton hopper which discharges into 25-ton trucks (four used in this service), which haul tailings to dump.
19. Strong solution carries 20 to 28 gpl copper, 4 to 6 gpl acid. Pumped by Bingham pumps (all pipes, valves, etc., are of lead) to strong solution storage.
20. Uses about 3200 tons per month of shredded tin cans shipped from the Los Angeles area by rail and brought from railroad in same trucks that haul copper out.
21. Twenty concrete launders, each with two sections in series 5 ft wide and 58 ft long (see drawing). Precipitation done in three stages. About 2500 tons cement copper produced monthly.

22. Spent solution pumped up to Fluo-Solids reactors to sluice calcine to waste.
23. Heyl & Patterson gantry crane, with special magnet for loading tin cans and 1½-yd clamshell bucket for unloading precipitate. Charges cans at 10 to 12 tph; unloads copper into one of two feed hoppers above 5x18-ft trommels discharging into drying basins. Same crane later loads copper into special 18-ton trucks for 12-mi haul to railroad at Wabuska. Precipitate runs 80% copper; is shipped to ACM smelter at Anaconda, Mont.
24. Sulphur ore (25% S) mined by P&H 1½-yd diesel shovel at Leviathan mine, Alpine County, Calif., 58 mi from Weed Heights. Ore hauled to plant on contract to Wells Cargo Co. in bottom-dump semi-trailer, 22-ton payload.
25. Ore stockpiled at mine, reloaded for short haul to crusher, pending possible construction of ramp for direct dumping into crusher.
26. Grizzly, 8-in. over 30-ton hopper discharging onto L-B 36-in. pan feeder over 18x36-in. Traylor jaw crusher, 3-in. discharge.
27. Belt conveyor, 18-in., over Transportometer weighing scale.
28. Ty-Rock 5x8-ft single-deck screen, ½-in. openings.
29. Symons 4-ft Shorthead cone crusher.
30. Belt conveyor, 18-in., plus 18-in. self-propelled tripper.
31. Four 300-ton steel ore bins.
32. Four Transporto-feeders in parallel.
33. Four 5x10-ft Marcy rod mills; handle 7 to 8 tph.
34. Four 18-in. belt conveyors in parallel.
35. Four FluoSolids reactors, 18 ft I.D., 4 to 5-ft bed, 2½- to 3-lb windbox pressure at 6500 cfm, from Roots blowers. Temperature held by water injection to 1100 deg F; exhaust gas, 10 to 12% SO_2; calcine, 0.3 to 0.4% S.
36. Four two-cell spray coolers bring exhaust gases down to 900 to 950 deg F to permit best operation of Buell dust collectors.
37. Spent solution sluices dust to waste area.
38. Four three-cell unit Buell cyclones.
39. Peabody scrubber, 500 to 700 gpm water added here becomes wash water in leaching vats, gases cooled to 650 deg F.
40. Western Precipitation mist Cottrell, four 98-tube units.
41. Chemical Construction Co. contact sulphuric acid plant, two 225-ton per day units. Acid consumption in leaching is about 75 to 80 lb of 100% H_2SO_4 per ton ore bedded.

"sweetener" truck loads of high grade ore will not go to the crusher so closely spaced that too many of them will land in the same leaching tank. Nor must they be spaced more widely than in adjoining tanks.

In other words, from the time a truck load of ore starts away from the shovel its whole course through the plant process has been planned and provided for.

To do this, drill holes for sampling are being put down on 100-ft centers inside the original 200-ft grid. All blast holes are sampled by means of cutters on the Joy drill. Based on these assays, and on the required copper output called for by management, the engineering office draws up a sketch map by 3:30 each day for each shovel, showing the mine shift foreman exactly where and how much this shovel will dig for the next 24 hr.

The engineering office gets a report each morning of how much ore was crushed the previous day and how much ore there is in the various bins. From all of this, it can be calculated with remarkable accuracy in advance, the grade of each leaching tank to be loaded.

Reports also come in each morning on tonnage dug by each shovel and where it worked. The engineering office uses all of these data to put together a weighted average of tons dug of various grades in order to come out with a feed to the plant averaging 0.9% Cu.

A record is kept of estimated grade and actual grade as a check on performance in planning. All of this is done, of course, in consultation with H. R. Burch and C. J. Houck, mine superintendent and mine general foreman, respectively, so that the mine plan will not call for some combination that could not be carried out.

Opening The Pit

Waste-ore ratio in the Yerington pit is about 1.7 to 1. In the western end of the pit area, bedrock lies under about 200 ft of gravel. The top bench at this end is now at the pit limit. The gravel dumps show up in the first airplane view on the opening page of this article.

Final slope of the pit will lie at about 1 to 1. It is planned to leave a 10-ft berm between the 25-ft benches in the final pit wall.

It's interesting to note why 25-ft benches were used. At first, when the shovels started into the gravel overburden, the plan was to use 50-ft benches. It became apparent rapidly, however, that this bench height was unsafe. The nature of the ground was such that the shovels could not avoid undercutting the bank, and eventually the lip of the bank would slough off, raising clouds of dust and endangering men and equipment below. On the other hand, a 25-ft bench was exactly the right height for the shovels, and the digging rate was actually greater with the 25-ft than with 50-ft benches.

As it turned out, this height was retained in digging ore because it is the only practicable way to mine as selectively as the orebody requires. The orebody varies both in grade and in hardness, not only laterally but vertically. Use of 25-ft benches makes selective mining easier, vertically as well as laterally.

Cut-off grade has been 0.6% copper, but it may prove that a cut-off of 0.5% is practicable.

Unwatering No Problem

One of the most interesting aspects of the pit operation is the method of keeping the pit dry. Originally the water table in the area of the orebody stood at an elevation of 4380 ft. The pit floor is now down to 4300 ft, but the water table has been lowered to about 4295 ft. The lower limit of oxide ore is at about 4200 ft.

Keeping the water table dropping in advance of mining has been done by putting down wells in a ring around the pit area. These are 9-in. holes, driven to a depth of 300 to 400 ft from surface with Bucyrus-Erie 42-T churn drills. Each well is equipped with a 500 or 750 gpm pump, which supplies needed water as well as keeping the pit dry by depressing the static water level. Four wells out of the five available are running at any given time.

Rotary Drill Used

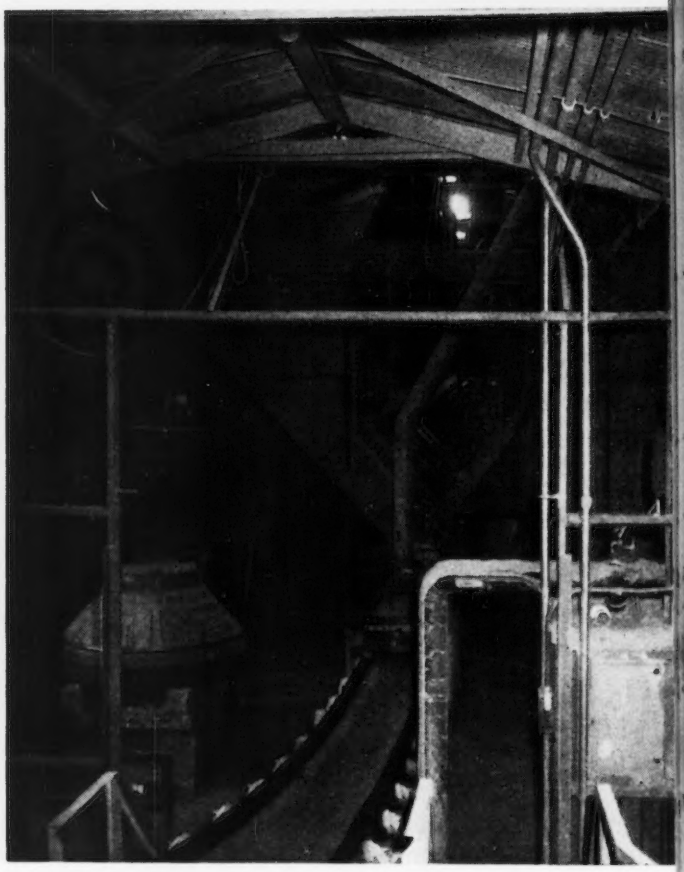
The Yerington ore is unsuited to churn drilling for blast hole purposes, but it is admirably suited to use of the rotary type. The rock is soft and caves easily, which proves troublesome to churn rigs.

All blast holes are now put down with a Joy Champion drill using 7⅜-in. Hughes 7-R "Hardrock" bits. Note performance data in Table I. The rotary drill has an over-all average of 264 ft per shift, and the churn drill used for blast hole work (with a 9-in. bit) averaged 53 ft per shift.

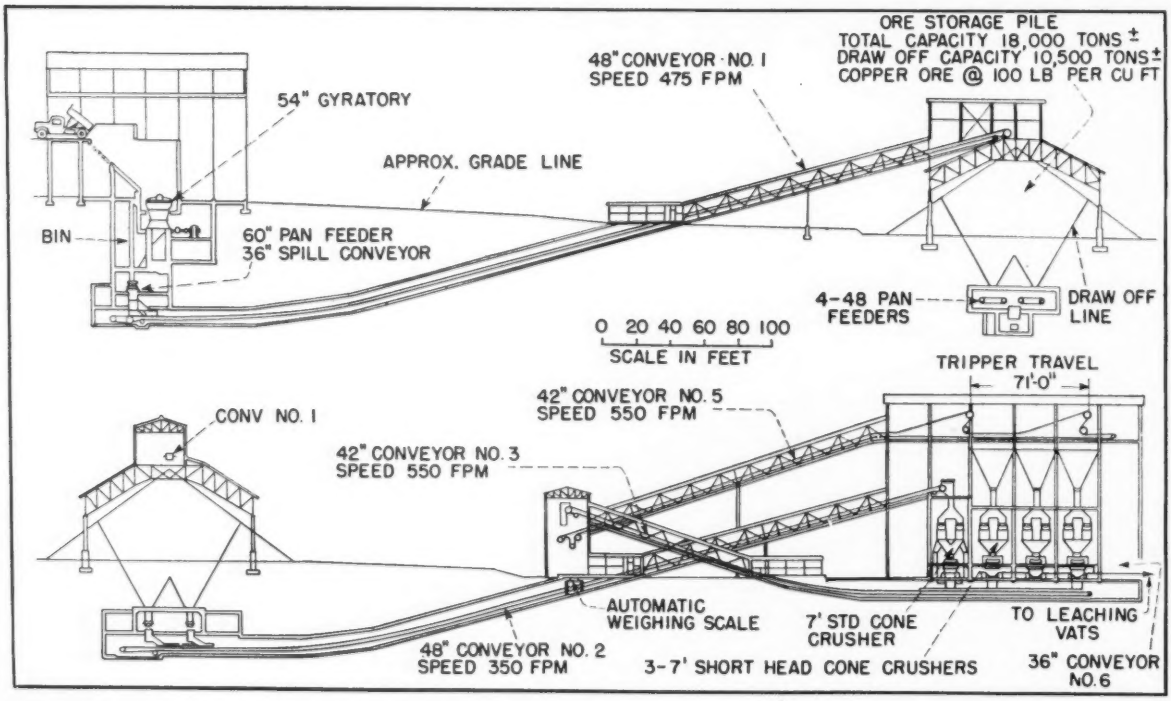
The rotary bits have averaged about 3300 ft per bit, but have gone as high as 3900 ft.

At present, one churn drill is working in the pit, putting down the prospect holes on 100-ft centers that act as guides in mine planning. The other is drilling water wells, to keep the depth from which water is drawn well below the pit floor.

PRIMARY CRUSHER, a Traylor 54-in. gyratory, takes feed in stride. Note dust collection opening in rear wall of pit.



WATER SPRAYS between each chute in secondary crusher plant agglomerate fines on feed belt, keep bedding uniform.



ORE TRAVEL through coarse ore storage (live capacity about 11,000 tons). Lower section is at right angles to upper section.

In general, the drilling pattern used at Yerington employs three rows of holes 20 to 22 ft apart, with the first row set 25 ft back from the toe of the bench. The holes are drilled on 25-ft centers, and are drilled to about 3 to 5 ft below grade. This basic pattern is varied, of course, to suit special conditions, and is constantly under study to see if different arrangements would improve results.

Three portable compressors are kept in the pit, and occasionally a boulder has to be drilled and blasted. Very little secondary blasting is necessary, however, as the photographs indicate.

It should be repeated here, perhaps, that drilling is done in strict accordance with the mine plan. The management knows in advance of each blast how many tons of broken rock, of what average grade, will be produced, and has decided in advance just which portion of it will be sent to waste, to stockpile, or to the plant.

To help the shift foreman locate the ore and waste sections into which the area of each blast may have been divided, the blasting crew puts the marking stake from each drill hole into a powder sack along with some sand, and leaves the sack alongside the hole. These sacks are still there after the blast. The stakes are recovered, and by comparing them with the bench map he has, the shift foreman can orient himself precisely and properly direct the shovel.

PRIMARY CRUSHER works two shifts daily, can crush 8000 tons per shift.

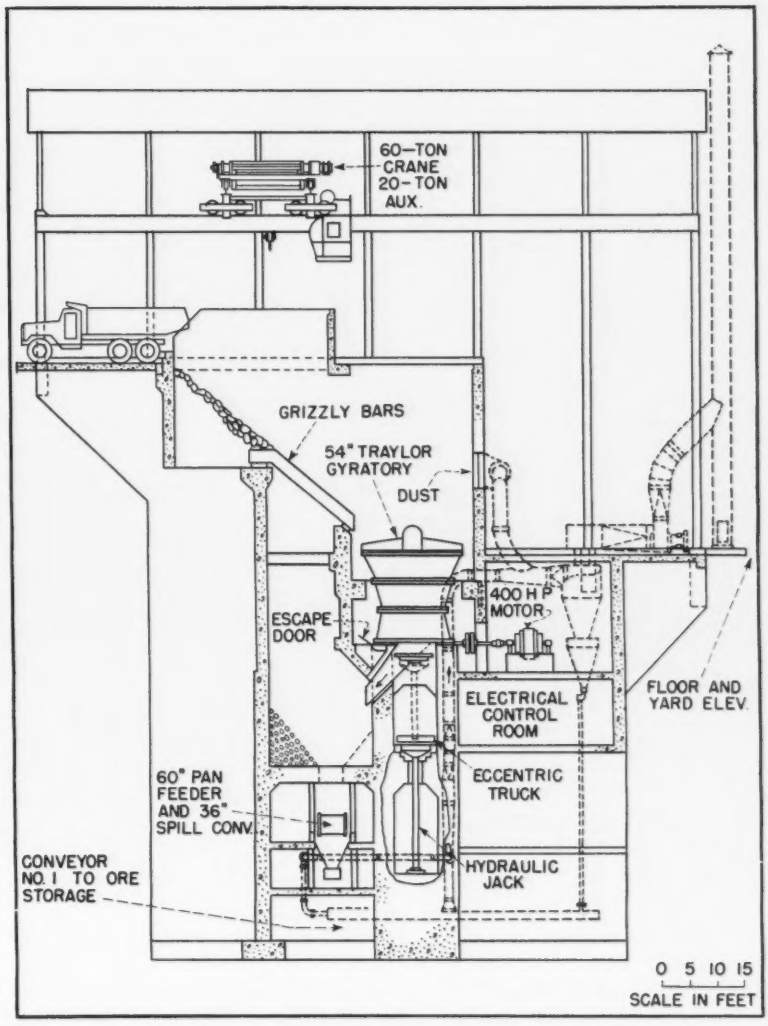
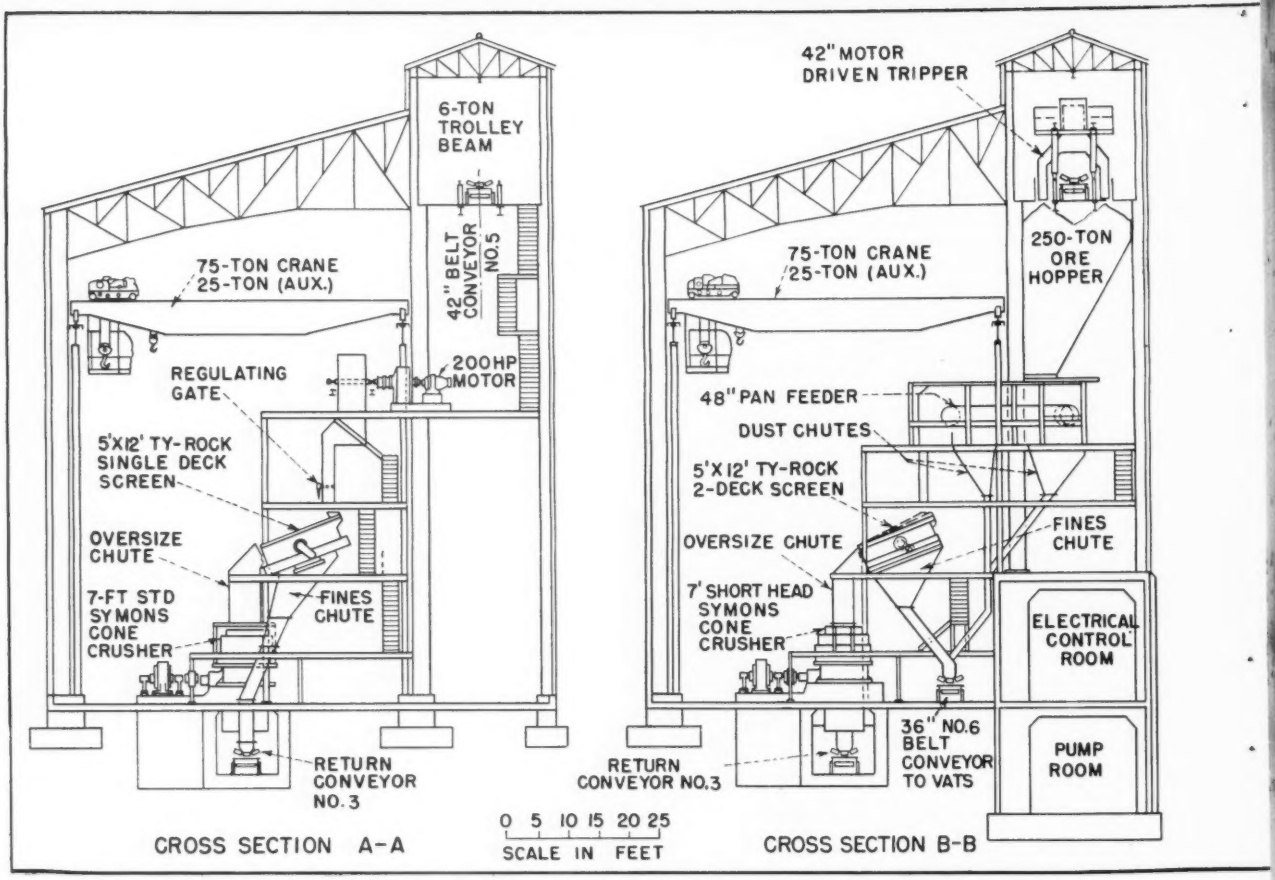


Table II. Typical metallurgical data covering a recent month's operation of leaching and precipitation plant, Weed Heights, Nev.

HEADS		
Ore charged, tons	321,284	
% moisture	7.318	
Ore charged, dry tons	297,774	
% oxide Cu, acid-sol.	0.876	
% other Cu	0.050	
% total Cu	0.926	
% ore on 4 mesh	40.0	
% ore on 20 mesh	75.3	
% ore minus 200 mesh	9.8	
TAILINGS EXCAVATED		
% moisture	11.19	
% oxide Cu, acid-sol.	0.075	
% other Cu	0.027	
% total Cu	0.102	
% extraction, ox. Cu	91.87	
% extraction, other Cu	43.75	
% extraction, total Cu	89.50	
Cu dissolved per ton ore, lb	17.38	
LEACHING		
Total sol. to leach circuit, gal	62,512,950	
Avg. gpl acid in leach circuit	35.7	
Avg. gpl Cu in leach circuit	18.467	
Avg. gpl Fe in leach circuit	13.5	
Avg. gpl Fe+++ in leach circuit	9.3	
Avg. temp. leach circuit, deg F	99.1	
Avg. atmos. temp. deg F	55.9	
Acid consumed, tons 100% H_2SO_4	11.460	
Acid consumed lb per ton ore bedded	77	
Acid consumed lb per lb Cu pptd	4.1	
PRECIPITATION		
Avg. gpl acid to ppt. launders	5.9	
Avg. gpl acid from ppt. launders	0.6	
Avg. gpl Fe to ppt. launders	12.403	
Avg. gpl Fe from ppt. launders	38.787	
Avg. gpl Fe+++ to ppt. launders	8.9	
Avg. gpl Fe+++ from ppt. launders	0.0	
Avg. gpl Cu to ppt. launders	24.439	
Avg. gpl Cu from ppt. launders	0.088	
% efficiency Cu recovery	99.640	
lb Fe consumed per lb Cu (est.)	1.208	
lb Fe consumed per lb Cu (actual)	1.25	
Total soln. to ppt. launders, gal	27,320,050	
Copper precipitated, lb	5,541,968	
ACID PRODUCTION		
Total days operated	28.51	
Tons acid produced, as 100%	12,181	
Tons acid in storage	—	
Tons sulphur burned	17,558	
% moisture in ore	8.0	
% sulphur in ore	26.84	
% conversion efficiency, SO_2-SO_3	97.18	
% conversion eff., S in ore to acid	91.8	



SECONDARY CRUSHING PLANT must reduce ore to ⅜-in. with minimum production of fines, hence large screen area.

In short, it is a rare thing to find a mine that operates so closely, and so successfully, in accordance with a detailed and complicated plan of attack as does this property at Weed Heights.

Firing The Round

Three 4x8-in sticks of 60% special gelatin, provided by Columbia Powder Co., go into the bottom of each hole, one of them threaded to a length of Primacord. Then 3½ to 4 cases of quarry powder are poured on top. Deck loading has not been found necessary. This procedure fills the lower 12 or 13 ft of hole with powder, and stemming is poured on top.

The only departure from this method is that taken to break up a hard block of rock that may be met high in the bench. In the accompanying photograph of a blast, the black puff shows where a shot of high-strength powder was put high in a hole to break up such a block. It broke it, too, whereas a similar block in the same blast, left without the "kicker" as a test, came through unbroken. It was left as a kind of doughnut, with the blast hole clean through the center.

The round is fired from a trunk line of Primacord on each row of holes with a cap on each end. DuPont MS connectors are usually placed between each row, (two on each end of the row) which gives about a 9 millisecond delay between rows. There has been no real problem with backbreak, and the shovels can dig whatever is broken.

The only element in connection with blasting that could be called a problem is a characteristic of the rock that produces a fracture upward and to the rear of some blasts at about a 45-deg angle. The whole volume of rock blasted seems to heave upward along this line, and there is a possibility that longer delays between rows might allow time for this throw of the rock to cut off the primers of the rear row of holes. If it is felt that a given blast will produce this result, the round is fired simultaneously.

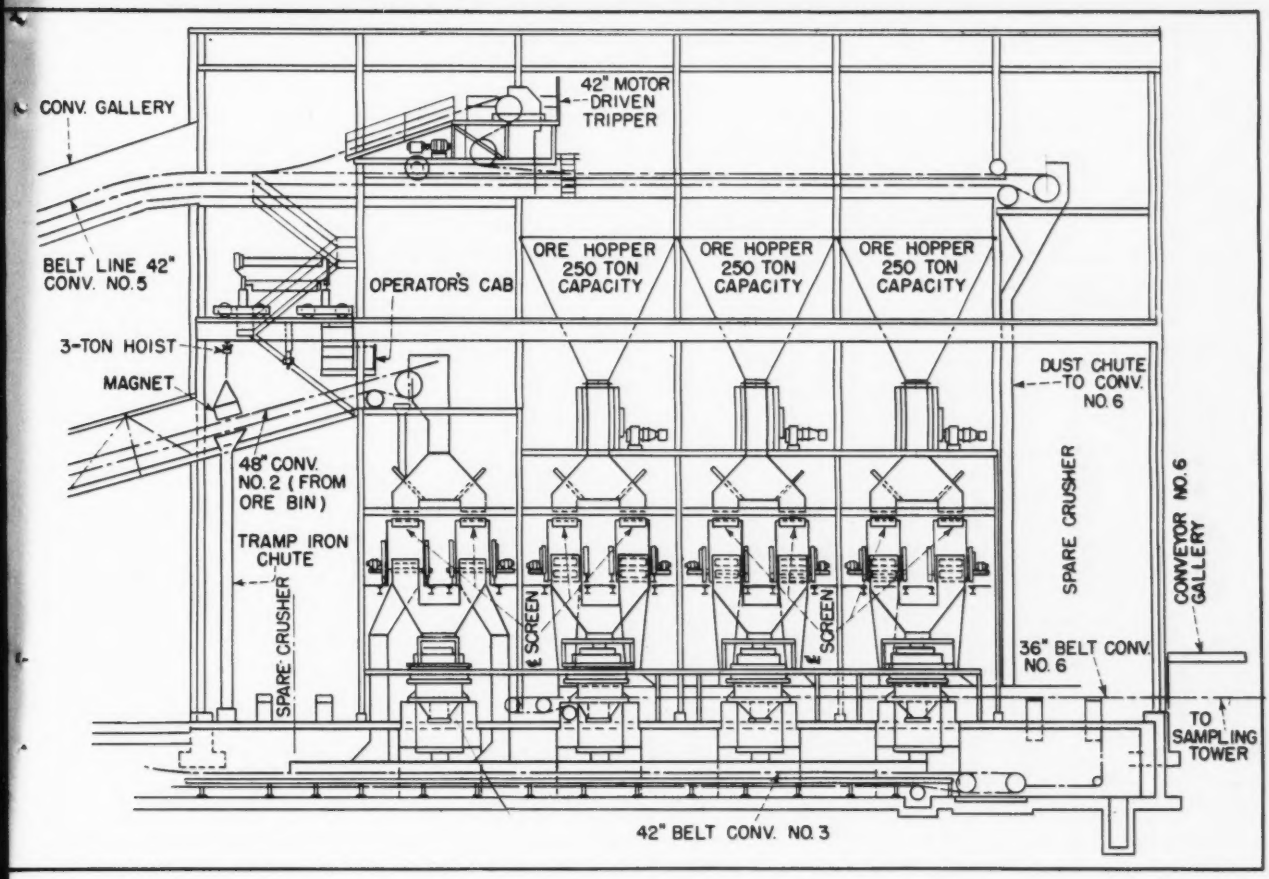
As shown in Table I, blasting produces an average of about 8 tons of rock per lb of powder used.

Loading And Haulage

At present, mine development has opened up about half of the pit. Actually, the mining has opened more than half the area, but only about half the available length. The first objective in mining was to cut down through the waste in the center of the pit area to get at a zone of high grade ore that was known to be there. This ore could then be used as needed to provide sweetening for any low grade sections that might have to be treated thereafter.

Typical of any pit that operates under Bert Millar's management, this Nevada pit exhibits the cleaned-up benches, the rock pushed back against the toe, the snap and precision in spotting trucks, and the attention to safety that mark a good operation. You won't, for example, find a shovel at Yerington mine digging against a face directly above which holes are being loaded.

The pit uses four P&H 1500 electric shovels with 5-yd dippers. They average slightly better than 7000 tons per shovel shift. The Magnetorque feature of these shovels has been found particularly useful here. By this method, 2300v ac is applied to the hoist drive motor, but there is no need to control it. Its shaft spins at all times, and the control is through a magnetic clutch



WATER SPRAYS wet each layer of ore dropping from screens above. This agglomerates fines, avoids segregation in tanks.

on the shaft. This clutch absorbs any shock met in digging. Current digging rate for the mine is about 1000 tons per hour.

Maximum grade on the pit's haulage roads is 8%, all against the load. The average haul to the primary crusher is about 0.8 mi. The company operates a fleet of 30 Dart end-dump trucks with 25-ton bodies. It takes seven trucks to keep one shovel busy. Four dipper-loads fill a truck.

Cummins 300-hp diesel engines are used, driving the trucks through Twin Disc 3-stage torque converters. The operators find the 3-stage converter satisfactory because in addition to smooth operation up grades, it provides adequate braking downhill.

As shown in Table I, truck performance has averaged as high as 1000 tons per truck operating shift.

In summer, two water trucks and a road grader are at work in the pit at all times to keep the haulage roads in condition. Further details on truck operation appear later in the article in a discussion of maintenance.

Plant Is Unique

Leaching at the Yerington plant is unique, so far as is known, in its method of providing acid (described later), and in the use of precipitation on iron as the sole source of copper recovery on so large a scale.

Flowsheet of the plant, and the major items of equipment, appear in an accompanying diagram and legend. There will be no attempt here to reproduce the flowsheet in the text.

Plant design was in the hands of Wilbur Jurden, consulting engineer for Anaconda and his staff. They worked in consultation with Frederick Laist, vice-president in charge of metallurgical operations, and Fred F. Frick, in charge of research at Anaconda. As the several drawings indicate, the design exhibits recognizable characteristics of the staff that has designed plants for Morenci, Andes, Chuquicamata, Cananea, Anaconda, and is now at work on the Erie Mining Co.'s. taconite plant.

In going through the flowsheet, one notes that control of the grade of the ore is all ahead of the primary crushing plant. Considering the wide spread in grade of ore, a bedding plant was not feasible. The coarse ore storage bin contains only enough ore to fill one tank.

Ingenious Agglomeration

Every percolation leaching plant faces the problem of segregation of fines. At an early stage, it was thought that special provision for agglomeration would have to be made at Yerington in the form of a balling drum or some similar device. However, tests by A. J. Gould, present plant superintendent, ably assisted by Frank Monninger, resulted in a simple system of agglomeration that has proven highly successful.

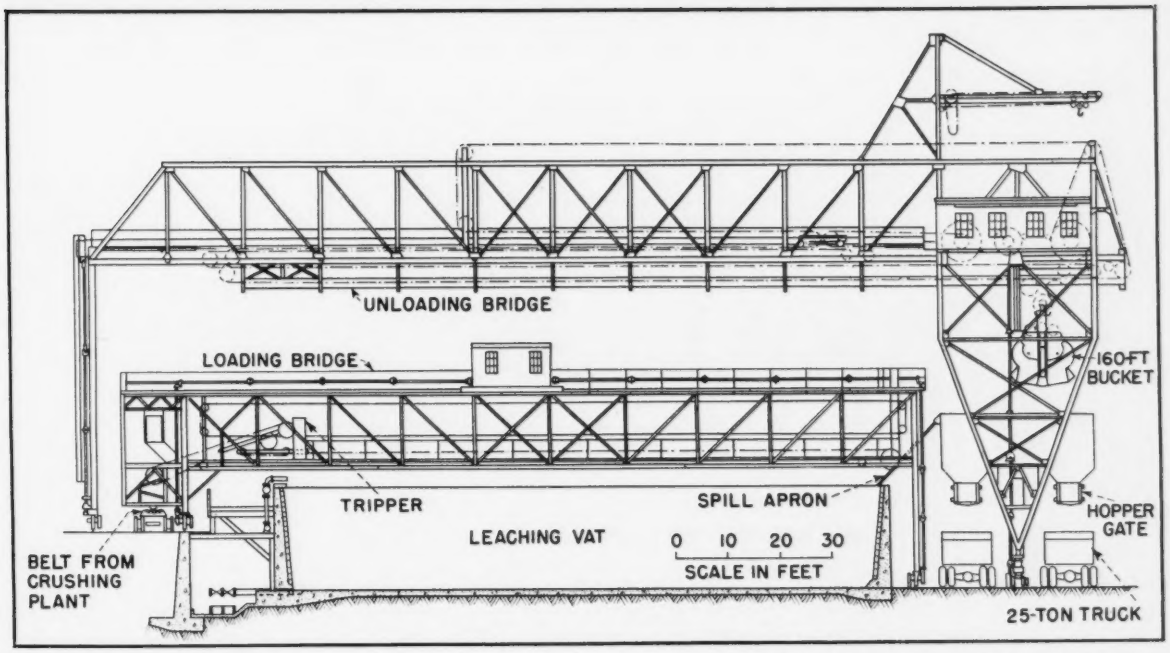
To begin with, the nature of the ore and the design of the crushing plant are such that relatively minor amounts of minus 200-mesh material are produced. The minus 3/8-in ore as sent to the tanks averages about 10% minus 200-mesh.

The Yerington system of agglomeration involves water sprays between each chute through which the finished ore drops down to the conveyor belt leading to the leaching tanks. There are six such chutes, as shown in the drawing of the secondary crusher plant. Each spray wets the surface of the layer of ore dropped just ahead of it, which means that the dry fines in the succeeding layer

LEACHING TANKS hold 11,000 dry tons of ore. Tank, foreground, is getting acid through recirculated solution. Next tank is ready to cover with strong solution. Tank beyond is being unloaded, next is draining, others are under recirculation.

TRIPPER on loading bridges discharges ore into tank. Note lack of size segregation, an outstanding Yerington success.

CONTROL BOARD in leaching plant office shows status of each tank each day. John Robertson reads Sunday's notes.



MATERIALS HANDLING for vats is done with these two bridges, built by Heyl & Patterson. Loading bridge handles 1500 tph, spread in six layers over one-third vat area at a time. Unloading bridge handles 900 tph with 8-ton bucket.

will stick to the wet coarse particles already on the belt.

In addition, the whole ore mass on the belt is tumbled four times before being deposited in the tanks; once by a stationary tripper, once by the sampling tripper, once by the tripper at the loading bridge, and last by the loading bridge tripper, itself.

Finally, the ore is dropped into the tanks through a grid of wooden slats. It is also deposited in six thicknesses, each about 3 ft thick, over only a third of the tank area at a time. All of this insures that there will be no segregation in the tanks, no complete blanket of fines, and therefore no channeling of solution, nor complete blockage of circulation.

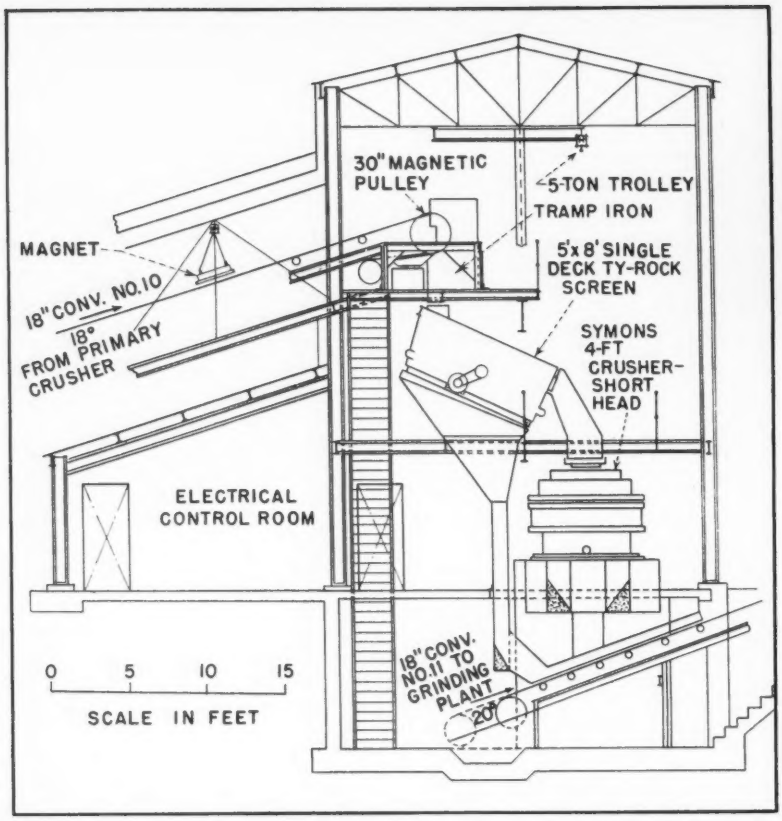
Test Plant Proof

This agglomeration action was observed in a small test plant, consisting of eight glass bell jars, mounted bottom-upward, in each of which a 30-lb charge of ore similarly agglomerated was leached. One could see that as the first solution mounted in the "vat", the fines sticking to the coarse particles simply settled evenly and did not block the interstices. Incidentally, this test plant made an excellent training ground for operators, because it was run exactly as the large plant is run, all operations being duplicated.

The fact that the size distribution in the tanks is successful is borne out by the metallurgical results, summarized in Table II. Extraction of the

Table III. Approximate schedule for complete leaching cycle in one tank, Anaconda Copper Mining Co., Weed Heights, Nev.

Period	Operation	Time hr	Acid Strength gpl	Remarks
First 21 hr	Cover	5		
	Recirculation	3	5 or less	
	Displacement	6		—To copper soln. storage.
	Recirculation	7	20–25	
Second 21 hr	Advance	5		—Cover next tank and continue as at left.
	Recirculation	3	50	
	Advance	6		
	Recirculation	7	40–45	
Third 21 hr	Advance	5		
	Recirculation	3	40–45	
	Advance	6		
	Recirculation	7	40–45	
Fourth 21 hr	Advance	5		
	Recirculation	3	40–45	
	Advance	6		
	Recirculation	7	25–30	
Wash period 32 hr	First wash	5		
	Recirculation	3		
	Second wash	6		
	Recirculation	7		
	Third wash	5		—To wash soln. storage.
	Drain	6		
	Excavating	17		
	Loading	14		



LONG FAST HAUL in 21-ton trucks of

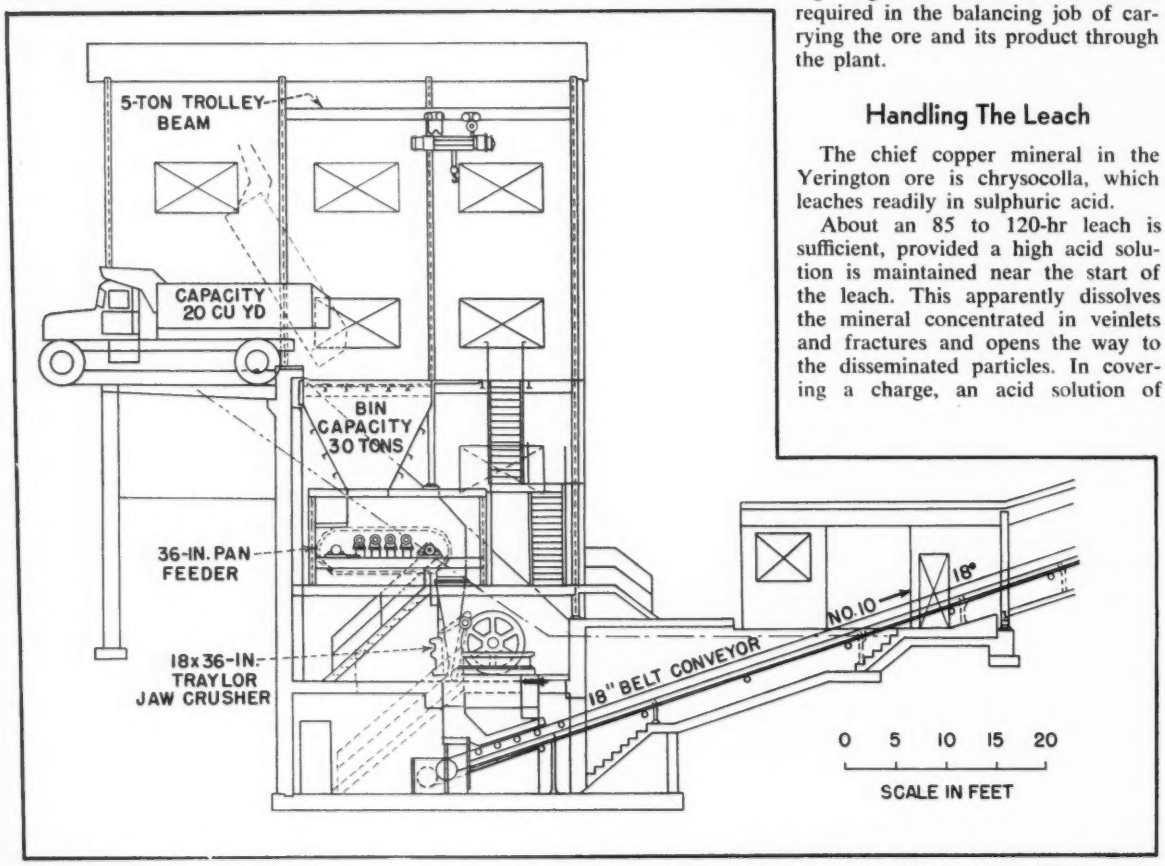
oxide copper runs about 92%, and of total copper, about 87%.

The chief variables in the leaching circuit are the recirculation time and the acid strength. The leaching conditions are quite well established by now, and adequate adjustment can be made by watching the head assays and allowing for variations in grade of ore. Of course, this depends on the validity of the weighted average grade of ore calculations of the mining plan, and on the timing and precision with which they are carried out. Over and over, in studying the Yerington operation, one is impressed by the high degree of skill and coordination required in the balancing job of carrying the ore and its product through the plant.

Handling The Leach

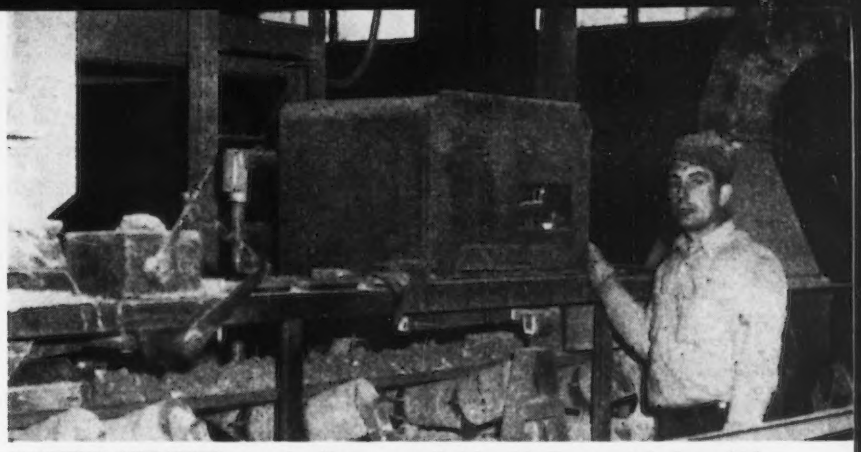
The chief copper mineral in the Yerington ore is chrysocolla, which leaches readily in sulphuric acid.

About an 85 to 120-hr leach is sufficient, provided a high acid solution is maintained near the start of the leach. This apparently dissolves the mineral concentrated in veinlets and fractures and opens the way to the disseminated particles. In covering a charge, an acid solution of



PRIMARY AND SECONDARY crushing plants for sulphur ore are simple, also have most effective dust collecting units.

Wells Cargo brings sulphur ore 58 mi.



SULPHUR ORE FEED to rod mills is controlled by this Transportofeeder, which thus controls feed to FluoSolids reactors. William Matthews checks reading.

ROD MILL FEEDER is controlled from this panel in FluoSolids reactor plant. Roy Crandall pushes button to raise feed rate, shown on dial as 8.6 tph.

about 35 to 40 gpl is used. Recirculation brings this down to a low acid point of about 2 to 3 gpl. This strong copper solution is drawn off by means of a displacing solution advanced from the preceding tank.

A tank of fresh ore is covered by letting fairly strong solution drain upward into it by gravity from the full tank immediately ahead. (No. 1 tank is covered by pumping from the bottom of No. 8).

This will fill about two-thirds of the tank, and then the solution level will begin to rise in the tank ahead, warning the operator that gravity is no longer enough to push the solution into the new tank. The rest of the solution is then transferred by air lift to the top of the fresh ore.

When the acid strength in the recirculating solution in the new tank drops to about 3 gpl, the solution is drained to the copper solution storage tanks and more solution advanced by displacement from the tank ahead, which solution has previously been built up to 50 gpl acid strength. When the acid content of the displaced strong copper solution averages 7 gpl, the flow to storage is cut off and recirculation begins again. Subsequent leaches all use a high acid strength solution, say 40 to 50 gpl, until ready for washing. All tanks are handled in exactly the same way. Solutions are advanced or recirculated at the same time all down the line. Solution flow through the circuit's airlifts runs about 2000 gpm. All piping and valves in the leaching circuits are of lead.

Acid of 93% strength is added as needed to the recirculation airlifts between tanks. The arrangement that has given least trouble is simply running the acid directly into the stream discharging from the airlift into the tank.

Construction of the reinforced concrete tanks is shown in an accompanying drawing. The interiors are lined with mastic. The filter bottom is made up of a bottom layer of 6x6-in. timbers on 1-ft centers, then a layer of 3x3 timbers, spaced 2 in. apart with two layers of coco matting laid over them and, on top of this, 6x8 timbers on 4-ft centers are placed for protection from the unloading bucket. Loading a vat takes about 10 hr; unloading, by 8-ton clamshell bucket, takes about 14 hr. Four 25-ton trucks haul tailings to the waste area. Metallurgical results are given in Table II.

Cementation

Consumption of iron is relatively low (1¼ lb per lb of copper); efficiency of copper recovery is about as high as it could be (99.64%). The point is that apparently this ancient technique has been taken too long for granted, for of all the elements in the Yerington flowsheet, the cementation launders offer the most opportunity for new metallurgical developments.

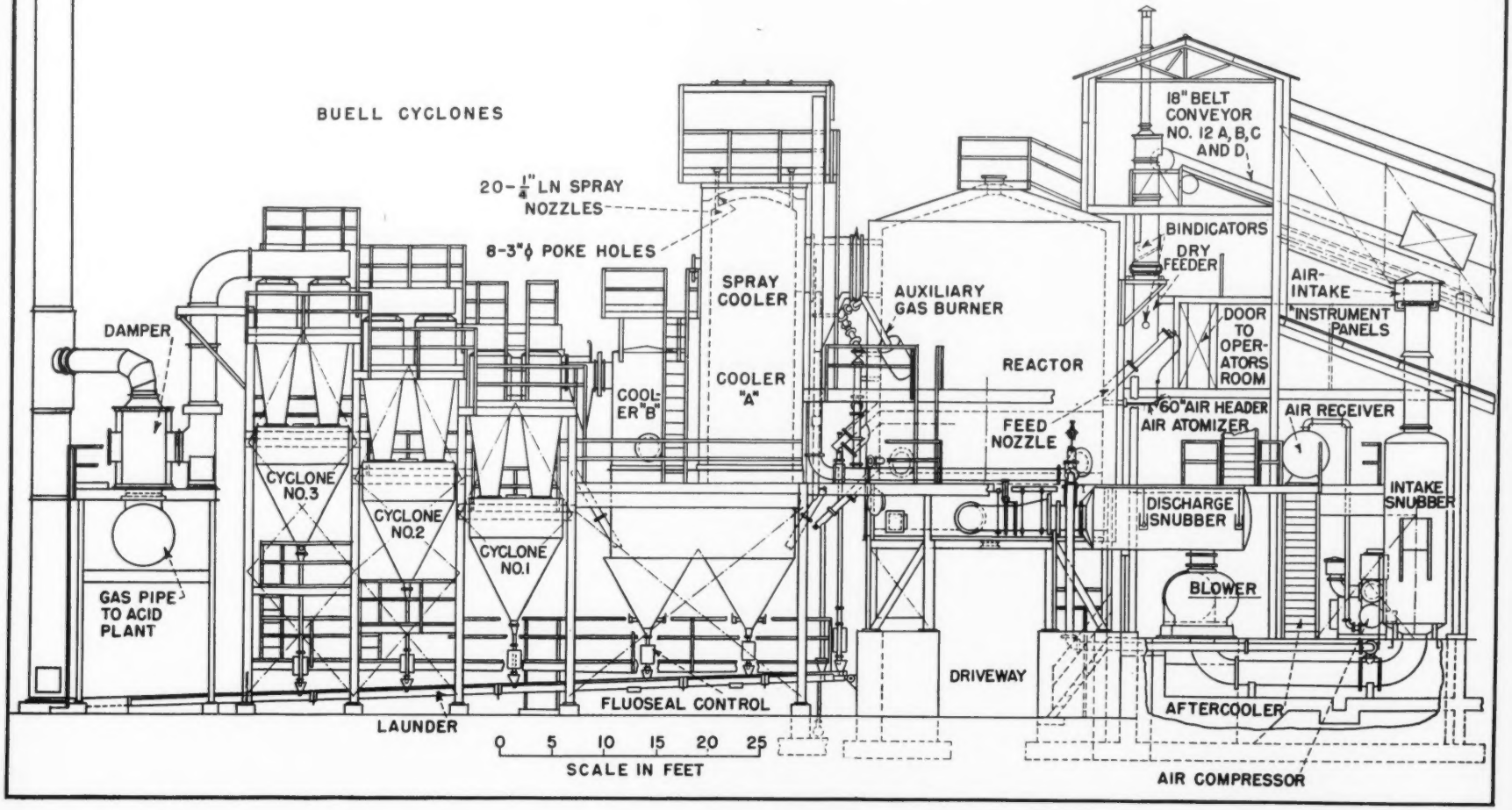
In the precipitation of copper on iron, the Yerington staff thoroughly realizes the many, as yet, unsolved problems that will require considerable work, study, and experimentation before completely satisfactory results may be obtained. Much progress has already been achieved, and it can truthfully be stated, or rather predicted, that greater advances will appear as time goes on. This work should warrant watching by any and all interested in similar problems.

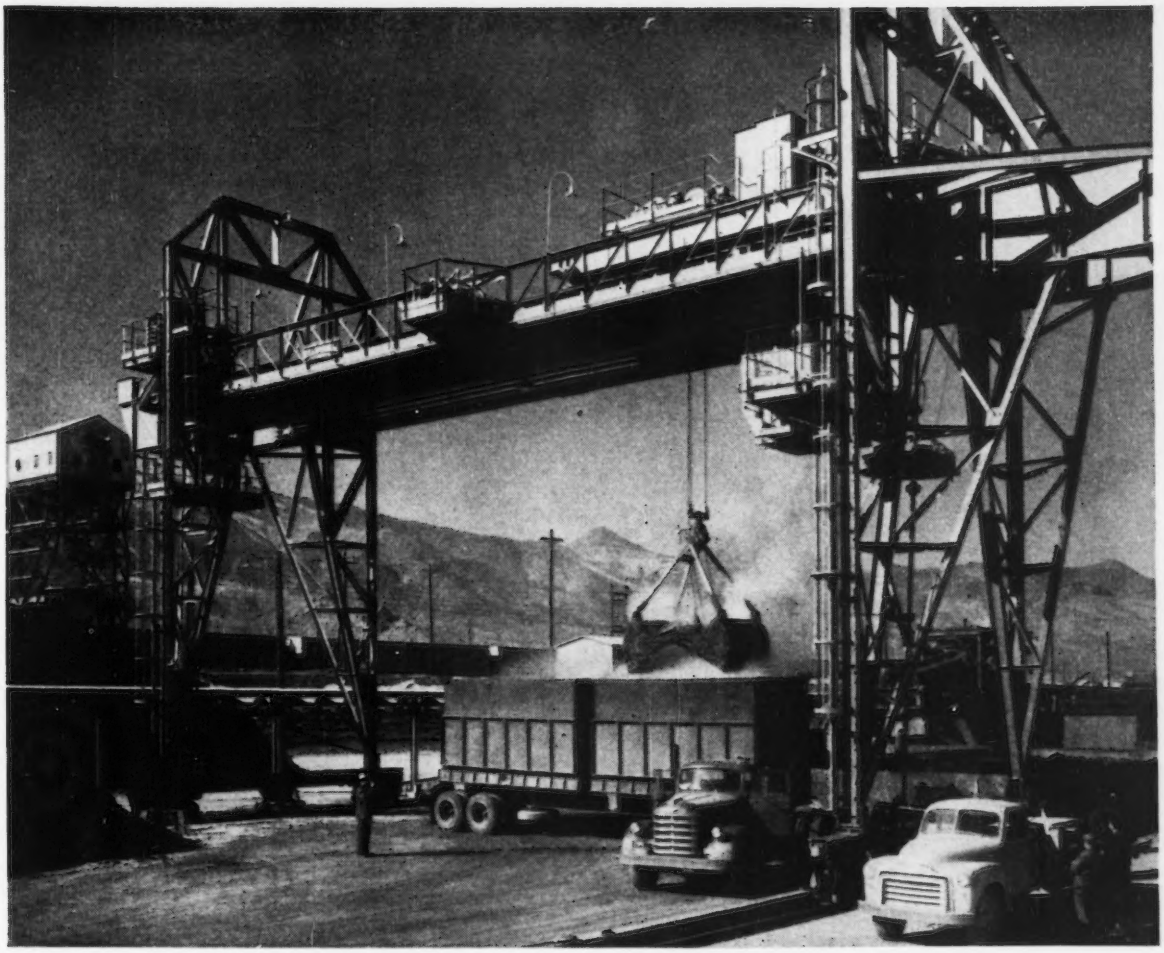
Flow of strong solution to the launders is held at 720 gpm, although recirculation of about 800 gpm brings total flow through the primary bank of launders to 1500 gpm. Cementation is done in three stages to insure complete stripping of solution. Solution flow is held at high velocity, partly to avoid precipitation of salts, and partly because it appears that copper precipitates in coarser particles if velocity of solution is high.

Note in Table II that copper content to the iron launders runs about 20 gpl, much higher than at many precipitation plants. Nevertheless, the content of the spent solution runs about 0.06 gpl, satisfactorily low. Apparently a high copper content in the

FluoSolids Reactors For Roasting Sulphur Ore

IN THESE REACTORS, the FluoSolids technique of the Dorr Co. produces a fume carrying 10 to 12% SO_2, which is washed, cooled, and converted to sulphuric acid in a Chemico contact acid plant. Charging mechanism shown is being modified.





GANTRY CRANE, by Heyl & Patterson, charges tin cans to iron launders, picks up copper precipitate in 1½-yd bucket. After screening and draining, cement copper goes into these special 20-ton semi-trailers (Millar-designed) to railroad.

feed does not mean a higher tailing loss.

Note also that the ferric iron content disappears altogether in the iron launders, taking about half a lb of metallic iron with it for each lb of ferric iron coming in. This is one of the problems still to be solved. Another point not settled as yet is the acid strength which should be maintained in the incoming strong copper solution in order to prevent precipitation of salts in the iron launders.

Arrangement of the iron launders is shown in accompanying drawings. Removed by the clamshell bucket on the gantry crane, the copper precipitate is washed in a trommel to remove unconsumed iron, etc., and then drained in concrete pits to about 25% moisture.

Weighing about 165 lb per cu ft, the precipitate is carried the 12 mi to the railroad to Wabuska in three custom-built trucks carrying about 20 tons per trip. The bodies, shown in photographs, were designed largely by Mr. Millar in cooperation with Fruehauf, the manufacturer. The trucks carry cans (which weigh only 22 lb per cu ft) back to the plant.

Metallurgical data on the precipitation plant appear in Table II.

Supplying The Acid

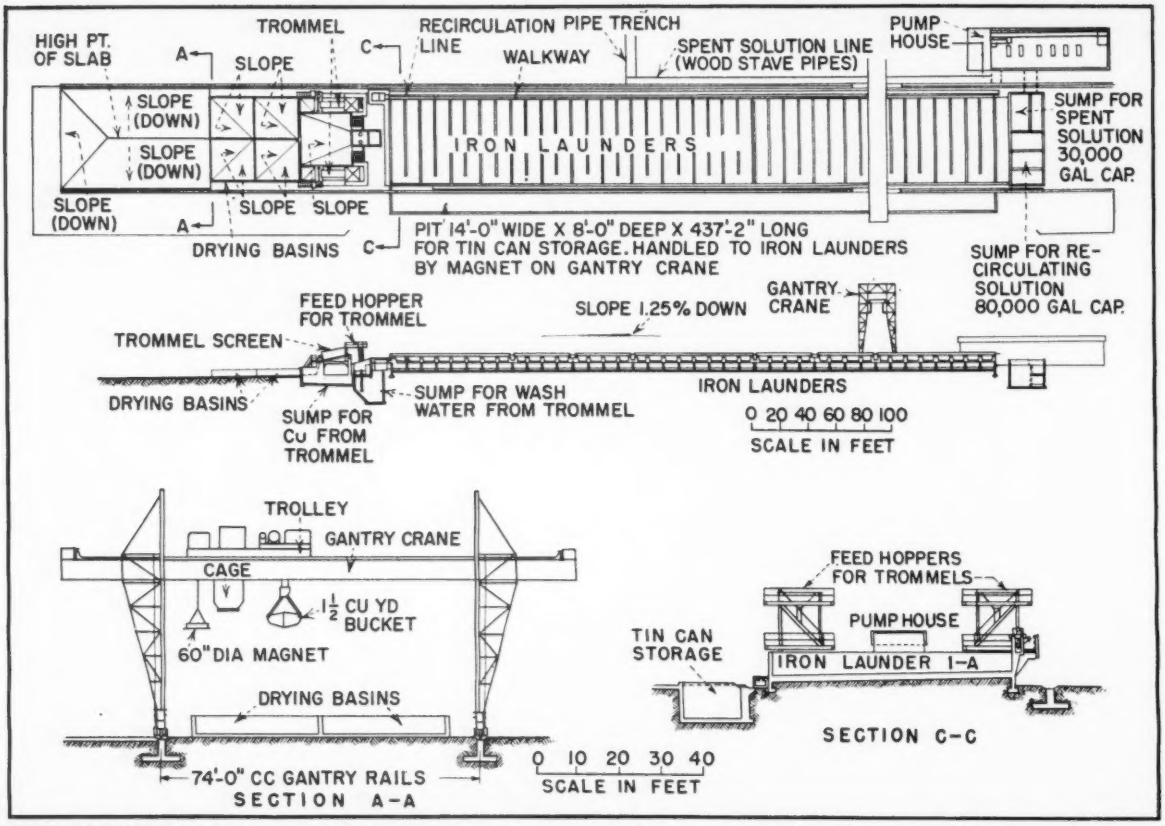
When the decision to go ahead with the Yerington project was made, the government asked Anaconda to find its own source of acid, sulphur being extremely short at the time. The nearest source of sulphur was the Leviathan mine, a property of Texas Gulf Sulphur Co. in California, 58 mi away. The only other possibility would be to get sulphur from Texas. As it turned out the unique arrangement developed for supplying sulphur produces it for a little less that it would have cost to bring it from sulphur mines in Texas.

Ore from the Leviathan mine, running about 25% elemental sulphur, is hauled to Weed Heights by Wells Cargo Trucking Co. of Reno on contract. The special Peterbuilt and Mack cabs and chassis have 300 hp Cummins engines, and haul about 21 tons of ore at highway speeds, governed at 50 mph.

Flowsheet of the sulphur ore treatment plant is shown as a part of the plant flowsheet. Note the interesting feature of controlling the feed to the rod mills that grind the sulphur ore to minus 10 mesh. Rod mill discharge goes directly into FluoSolids reactors, which in turn supply SO_2 to a contact acid plant. Therefore the higher the feed to the rod mills, the more fume available for acid, within certain limits.

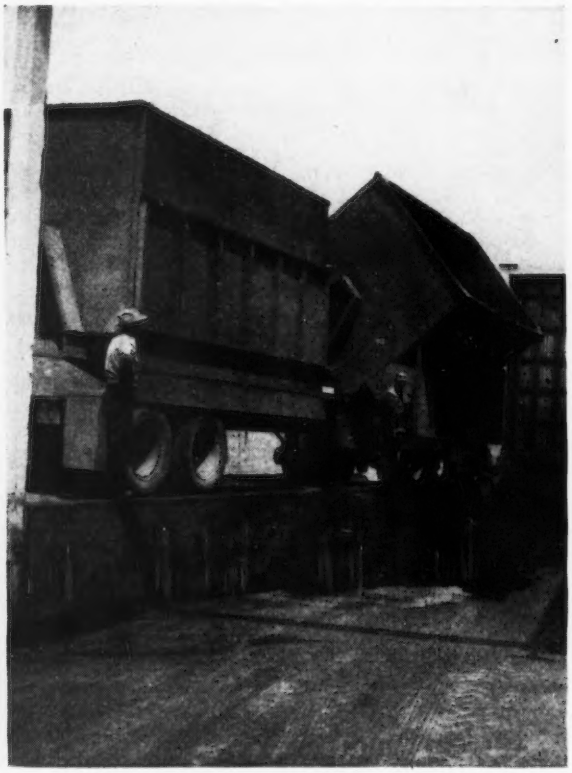
Rod mill feed is controlled by a Transporto feeder that can be varied by the FluoSolids operator up in the reactor control room. A photograph shows this feature. The time lag between a rod mill feed change and the resulting gas strength change is about 15 min.

Moisture content of the sulphur ore from the mine is about 6%. If it runs up to 9% the rod mill grinding ability falls off. Consumption of the



IRON LAUNDERS, showing general layout and sections at drain pits and first launder. Plant is arranged in three sections, solutions are stripped in three stages. Cement copper runs 80% Cu; spent solution assays 0.08 gpl Cu, 0.6 gpl acid.

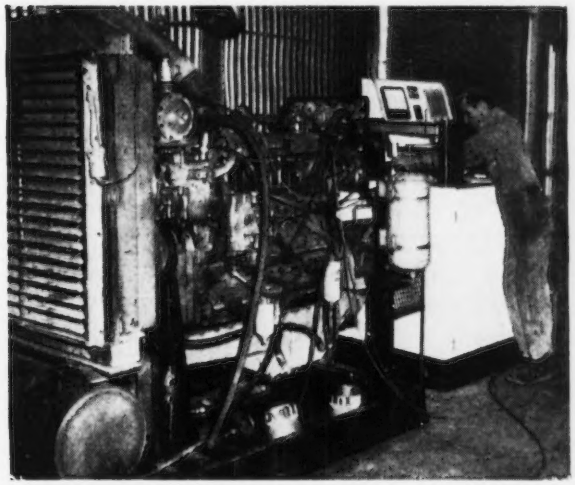
CHARGING CANS with special magnet that handles 10 to 12 tons per hr. Circulation is up through bottom at 1500 gpm.



CONCENTRATE TRUCKS haul copper to railroad, bring cans back. These are Fruehauf trailers, Diamond T tractors.

RADIO helps immeasurably. Here W. M. Cross, garage foreman, talks with his shop from repair trucks on job out in the mine.

RALPH SOKOL shows torque converter improvement (see text).



OVERHAULED ENGINES go on test stand for run-in. Tex Maness checks instruments. Engines are pulled at 3200 hr.

FUEL PUMPS on Cummins engines of 25-ton Darts get regular cleaning in garage. Roy Gibbons takes care of this one.

3-in. rods runs about 1.4 lb per ton of ore. Each mill carries about 10 tons of rods.

Four 18-ft FluoSolids reactors are available, but only three are operated under normal conditions. Started by burning propane, the reactors carry themselves once a temperature of 900 deg F is reached. Thereafter the temperature is held to about 1100 deg F by controlling with cooling water.

The reactors carry a 4-to 5-ft bed of calcine regulated by pressure drop through the bed. Roots blowers supply about 6500 cfm of air at 2½- to 3-lb windbox pressure. The calcine discharge assays about 0.3 to 0.4% sulphur.

Feeder Equipment

Operation is satisfactory, although some difficulty has been met in feeding the ore. A form of star feeder is being tried. Exhaust gas runs 10 to 12% SO_2. This is diluted to about 7½% to 8½% before entering the contact acid plant proper, which is the content of SO_2 the acid plant was designed to handle.

It was planned to run the reactors at 1250 deg F, but to cool the gas down to a temperature the following Buell cyclones could handle, so much water had to be added in the spray coolers that they mudded up.

Actually, considerably more minus 10-micron dust has turned up in the circuit than had been expected. The result is that the mist Cottrells (see flowsheet) are recovering considerable amounts of dust. Apparently when the sulphur is burned out of the finest ore particles, a bond is broken that releases extremely fine dust.

About 500 to 700 gpm of fresh water is added to the Peabody scrubber as a spray, which cleans the gas and cools it to about 110 deg F. This water goes directly to the wash storage tanks in the leaching plant.

The acid plant is a standard two-unit, 450-ton per day, contact acid plant designed and built by Chemical Construction Co. Noted for its excellent heat balance and for several automatic features, the Chemico plant has operated extremely well. A striking equipment item is the huge Elliott turbo-blower, rated at 58,000 cfm under operating conditions, that pulls gas through the plant. Driven by a 1200-hp motor, the blower is said to be the largest of its kind.

Acid, at 93% strength, is pumped up to two 2500-ton storage tanks. The leaching plant uses 400 to 500 tons of acid per day, which is sent to it through two 250-ton measuring tanks.

Keeping Trucks Rolling

A glance at Table IV will show why maintenance of mobile equipment is so important an item at Yerington. Everything that enters or leaves Weed Heights and the plant area does so by truck, bus, or pas-

senger car. Hence the great variety, and the huge investment, in Yerington's stable of mobile equipment.

Under the direction of W. M. Cross, garage foreman, there are 76 men working 6 days a week on maintenance of the equipment listed in Table IV. The garage works three shifts for five days a week, two shifts on Saturday, one shift on Sunday.

Maintenance First

Note that "repair" hasn't been mentioned as yet. The emphasis is on maintenance at Weed Heights, in the belief that maintenance properly done does much to eliminate repair, especially emergency repairs.

The maintenance department uses a series of cards in the charting of routine maintenance for the 25-ton Dart trucks. There is one of these cards for a daily check, as well as for 100-hr checks, and so on up to a 6400-hr overhaul. It has been the practice to give the truck engines a "frame overhaul" at 3400 hr, but Mr. Cross now believes that it may be better to pull the engines at that time and do a real job on them, rather than to work on them in the frame.

As an example of what the garage can do, note Ralph Sokol's job on the torque converters, shown in a photograph. The shop produced a retaining ring for front and rear bearings with a tighter fit than formerly, and also supplied an extra drain opening for both bearings so that grease working in behind the seal could be flushed out. This ended trouble with blown-out seal rings and burned bearings, which were running about 10 a month.

Tire life on the big trucks runs about 3800 hr, front and rear. The Darts carry 1800x25 tires on rear wheels and 1400x24 on the front.

In general, no engine in the Darts is run beyond 6400 hr without major overhaul, but one experimental engine has gone well beyond 9000 hr without being pulled and overhauled.

Assay Office

Under the direction of F. S. Stewart, chief chemist, the assay office runs about 75 to 90 mine samples daily by the short iodide method, plus 50 to 60 electrolytic assays and 20 plant solution samples daily. In addition there are several screen assays to be made, plus 14 sulphur samples from, the Leviathan mine.

Mr. Stewart's quick method for sulphur on these samples is simply to take 10 grams of the sample on which moisture has been determined, burn it until the SO_2 is gone, then weigh it. The weight loss is assumed to be the sulphur content. This checks the barium sulphate method very closely.

A Place To Live

One of the happiest features of the project is the town of Weed Heights, itself. Here are 55 three-bedroom, 115 two-bedroom, and 80 one-bedroom homes, all of the most modern construction, carefully-designed, and equipped with the best in stoves, refrigerators, washers, heaters, and other equipment. These rent for from $20 to $30 per month, rentals that do not begin to return the cost of the dwellings.

There are also eight dormitories for single men, a soda fountain and lunch counter, a playground, a swimming pool suitable for a town of 10,000 people, a post office, softball field, tennis courts, and plenty of water for lawns and small gardens. All social activities are managed by an employee association.

Power comes into the project from the Sierra-Pacific Power Co. via a new line, Washoe to Carson City to Weed Heights, over 70 mi long. The project takes 5000 to 7000 kw, and incidentally has a very favorable power factor owing to the designers' having called for synchronous motors wherever possible in the plant.

All in all, the power factor isn't the only thing that's favorable at Weed Heights, by any means. The people now living there have a good place to live, an interesting job to do, and the knowledge that what they are doing is not only useful, but in large measure unique in the history of their industry.

In commenting on this achievement, Bert Millar leaves no doubt as to where he thinks credit is due. He feels that he has an extremely competent operating staff, and any perceptive observer must be inclined to agree with him. The Weed Heights men are hard-working, loyal, energetic, and intensely interested in making a success of the job. They have gone from sagebrush to 5-million lb of copper per month in a period of two years. They are proud of it, and they have a right to be.

Table IV. List of mobile equipment operated by Anaconda's Nevada project and maintained by its garage.

OPERATED AT YERINGTON

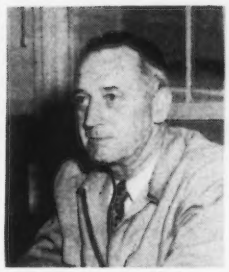
Make	Service	No. of units	Make	Service	No. of units
Chevrolet	Garbage truck	1	Fruehauf	Std. trailer	1
Chevrolet	School coach	1	Fruehauf	Trailer, side dump	3
Chevrolet	Truck, 2-ton	1	Fruehauf	Low-boy	1
GMC	Fuel truck	1	LeTourneau	Tournadozer	1
GMC	Winch truck	1	Hough	Payloader, HFH	1
GMC	Water truck	2	P&H	Hoe attachment	1
GMC	Service truck	1	Chevrolet	Sedan	5
GMC	Dump truck	1	Chevrolet	Coupe	2
GMC	Flat rack truck	2	Buick	Sedan	1
Dart	End-dump, 25-ton	30	Chevrolet	Suburban	1
P & H	Elec. shovels, 5-yd.	4	Chevrolet	Ambulette	1
P & H	Westcoaster crane	1	Chevrolet	Truck, ¾-ton	1
P & H	Std. truck crane	4	Chevrolet	Pick-up, ½-ton	17
Caterpillar	Tractor, D-8	5	Chevrolet	Truck, 8-ton	2
Caterpillar	Motor grader	2	Chevrolet	Bit truck	1
Caterpillar	Ripper	1	Bucyrus-Erie	Churn drills	2
Diamond-T	Highway tractor	4	Joy	Rotary drill	1

OPERATED AT LEVIATHAN SULPHUR MINE

Make	Service	No. of units
Joy	Rotary Drill	1
P&H	Diesel shovel, 1½-yd.	2
Caterpillar	Tractor, D-8	1
Caterpillar	Motor grader	1
Chevrolet	Pick-up, ½-ton	1
Dart	End-dump trucks, 10-ton	4

A. E. Millar, general manager

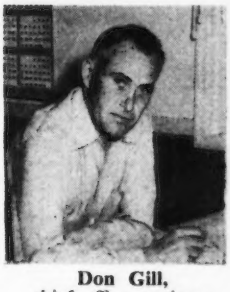
H. R Burch, mine superintendent



A. J. Gould, plant superintendent

C. J. Houck, general mine foreman

F. M. Monninger, general plant foreman



Don Gill, chief office engineer

Howard Jacky, acid plant foreman

Ken W. Humphreys, personnel supervisor

W. M. Cross, garage foreman

F. W. Stewart, chief chemist

Anaconda Copper Mining Co., Weed Heights, Nev.

GENERAL MANAGEMENT

Cornelius F. Kelley, chairman of the board, New York
Robert E. Dwyer, president, New York
Clyde E. Weed, vice-president in charge of operations, New York
Edward S. McGlone, executive vice-president, New York
Frederick Laist, vice-president, metallurgical operations, New York
Richard S. Newlin, vice-president, mining operations, New York
A. E. Millar, manager in Nevada for entire project

OPERATING STAFF—WEED HEIGHTS, NEV.

A. E. Millar, general manager
Don Gill, chief office engineer
Ken. W. Humphreys, supervisor of personnel
W. M. Cross, garage foreman
H. R. Burch, mine superintendent
C. J. Houck, general mine foreman
F. A. Keith, foreman Leviathan mine
J. J. Hyland, master mechanic
M. H. Bissett, chief electrician
A. J. Gould, plant superintendent
F. M. Monninger, general plant foreman
Howard Jacky, foreman FluoSolids and acid plant
F. S. Stewart, chief chemist

DESIGN

Wilbur Jurden and Staff—In charge of all plant design.
A. E. Millar—In charge of design of housing, offices and shops and all mining development.
J. S. Wordie—In charge of construction for Anaconda.

CONSTRUCTION

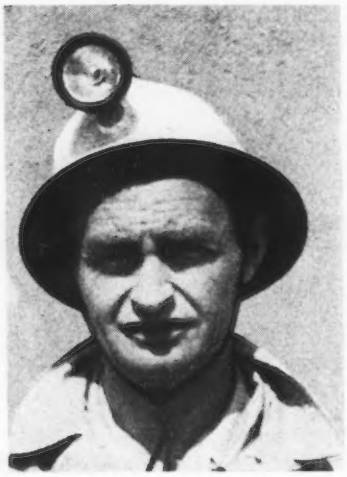
James A. McNeil Co., Alhambra, Calif.—general contractor for plant construction
Acid Plant—Chemical Construction Co., New York, N. Y.
Electrical work—Newbery Electric Corp., Los Angeles, Calif.
Concrete work—Baker-Mitchell-Thwing Co., San Bernardino, Calif.
Steel work—Vinnell Corp., Los Angeles, Calif.
Townsite buildings—Weichmann & Probasco, Reno, Nev.
Loading and unloading bridges, gantry crane—Heyl & Patterson, Pittsburgh, Pa.

ADDITIONAL SUB-CONTRACTORS

O. G. Kelly & Co., Elizabeth, N. J.
Dante Pistone, Yerington, Nev.
Pittsburgh Test Labs., San Francisco, Calif.
Plant Asbestos Eng. Co., Emeryville, Calif.
Pittsburgh-Des Moines Steel Co., Santa Clara, Calif.
Fidelity Electric Corp., Los Angeles, Calif.
Morley Cooling Tower Co., Kansas City, Mo.
Triangle Rock Co., San Bernardino, Calif.

New scraper ramp connected to three close-coupled Granby-type mine cars. Operator is protected by screen.

Essential parts of the loading unit consist of double-drum hoist, sheaves to guide pull and tail ropes, and tail sheave.



Mining engineer Ivar Berge designed the scraper ramp unit shown above.

Thor Amdahl, managing director of Fosdalens Bergverks A/G, Malm, Norway.

"A most promising loader," says C. C. Austin, who saw the unit in Norway.

Fosdalens Steel Scraper Ramp Speeds Up Mine Car Loading

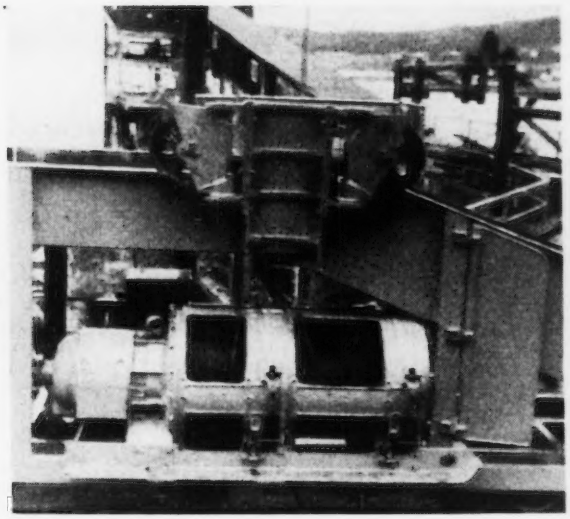
WHEN C. C. AUSTIN,[1] retired general manager of the Mancha Division, Goodman Manufacturing Co., toured Norway last year, he ran into what he describes as "a most promising scraper loader" at Fosdalens Bergverks A/G, Malm, Norway. Details of the unit designed by Ivar Berge, mining engineer, are shown in the illustrations above and on the following page of this article.

The Scraper Ramp

Note in the series of illustrations that the scraper ramp is attached to the front end of a three-car (Granby type) train. A 50-hp, double-drum Ingersoll-Rand 50 ML-4D hoist is mounted snugly out of the way below the scraper ramp, but in such a position that its pull and tail ropes can be threaded through the guide sheaves above the hoist. Tops of the Granby-type mine cars are rebuilt to provide a sliding surface for the scraper, and sides are extended upward to prevent spillage.

During loading, the car couplings are pulled together as shown, so that adjoining car-ends meet, thereby preventing spillage between cars as the

[1] C. C. Austin has already contributed several stories to *E&MJ* on unique operating techniques including "Roof Sewing," September 1953, p 91; "Underground Receiver at Rodsand Provides Steady Mine Air," *E&MJ* August 1953, p 92; "Why Mines in Norway and Sweden Adopted Flat Steel," *E&MJ*, October 1953, p 86.



50-hp double-drum electric hoist powers the scrapers. Note that the hoist has been mounted snugly beneath the ramp.

Close-coupled cars with steel sideboards and flanged tops permit smooth scraper travel and prevent spillage of ore.

Couplings are folded out of the way in this manner during loading to permit ends of adjacent cars to meet.

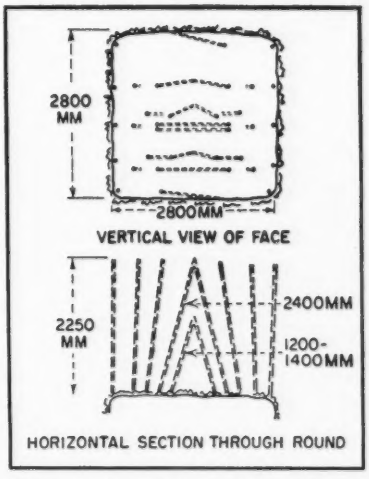
Tail sheave is mounted to one side of centerline of train to steer the scraper down the center of the train of cars.

loaded scraper passes over them. A rigid tail pulley mounted behind the train is fitted with two sets of guide pulleys to assure smooth travel of the scraper over the center of the cars.

In an experimental tunnel project, the unit demonstrated that it performs reliably. It will be given a more thorough test in the future when the mine's 6000m main tunnel will be extended, according to Thor Amdahl, managing director.

Experimental Tests

The following data give facts and achievements of the experimental tests in hard rock with the new scraper loader: Cross section of the tunnel measured 2.8m wide by 2.8m high including an arched top. Area of the face was about 8 sq m; depth of round, 2m; solid rock broken per round, 16 cu m; volume of broken rock per pound, 30 cu m; grade of the tunnel was about 0.33%.



Drill round used in initial test drive in tunnel at Fosdalens.

Two Rounds Per Shift

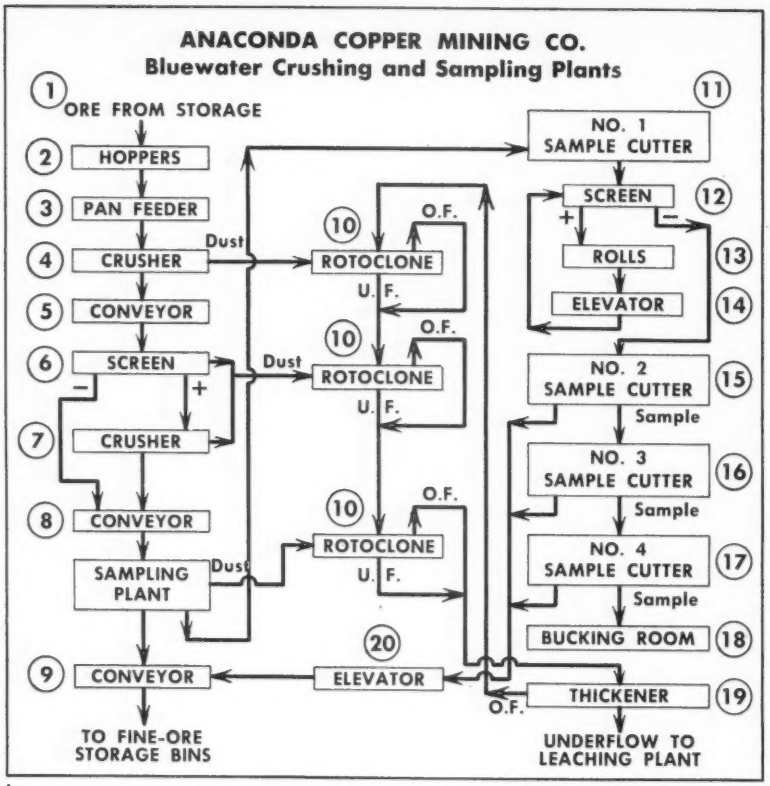
Details of the 34-hole round drilled are shown in the accompanying illustration. Holes were put in with Atlas-Diesel feed-leg type drills. In the experimental rounds, portal-to-portal time for the shift was 7 hr 15 min; average working time for the crew was 6 hr 15 min. The crew, consisting of two drillers and one loader, put in one round per shift, but it was confident that with an additional driller the progress could be increased two rounds per shift. "And I believe they will do it" comments Mr. Austin, "These Norwegians are good!"

New Mexico

Its development obscured by the uproar farther north, the Grants district shows significant growth, centered on Anaconda's new treatment plant.

JOHN B. HUTTL,
Associate Editor

SAMPLING PLANT for nearby uranium producers is run by Anaconda for AEC.



LEGEND

1. Euclid trucks and Tournapulls from storage pads
2. Two hoppers with grizzly covers containing 14½-in. square openings
3. Denver-type pan feeder installation
4. Denver jaw crusher
5. Belt conveyor, 18-in.
6. Ty-rock vibrating screen, 4x6-ft with 1-in. square openings
7. Symons cone crusher
8. Belt conveyor, 18-in.
9. Belt conveyor, 18-in.
10. Three Type N Rotoclone units
11. No. 1 sample cutter, taking a 24% cut
12. Ty-rock vibrating screen 3x6 ft with ¼-in. openings
13. Allis-Chalmers rolls, 30x14-in.
14. Bucket elevator
15. No. 2 sample cutter—20% cut
16. No. 3 sample cutter—20% cut
17. No. 4 sample cutter—2 to 5% cut. Final sample is 1% of feed
18. Bucking room
19. Thickener
20. Bucket elevator

BECAUSE IT HAS BEEN CONDUCTED QUIETLY and efficiently, without the far-reaching publicity linked with a number of other uranium operations, few people know the whole story of the uranium development of the Anaconda Copper Mining Co. in New Mexico.

Certainly the whole story won't be told here, or anywhere else, security regulations being what they are. But enough of it can be told to make it seem likely that Anaconda is developing a uranium-producing district that doesn't need to bow to any other, in the U.S. at least.

The Haystack First

Back in the summer of 1950, the Santa Fe Railroad announced the discovery of high-grade uranium ore on land it owned near Haystack Butte north of Grants, N. M. This discovery was the first found in the Todilto limestone of Lower Jurassic age. It was made by an Indian, Paddy Martinez, who thus started an operation bigger than he had ever dreamed of.

Following the Haystack discovery, Anaconda sent V. D. Perry and other geologists into the area late in 1950. Early in 1951, under the direction of J. B. Knaebel, present manager of the uranium project the company began an intensive exploration campaign for more ore of the limestone type.

These efforts resulted in development of Anaconda's Section 9 mine and other properties of the limestone type. Enough ore was developed by Anaconda, the Santa Fe, and others that the AEC asked Anaconda to establish and operate a uranium buying depot at Grants.

This Anaconda did. The company operated a temporary sampling and ore-buying plant at Grants from June 1952 to and through September 1953, when the temporary plant was

Uranium

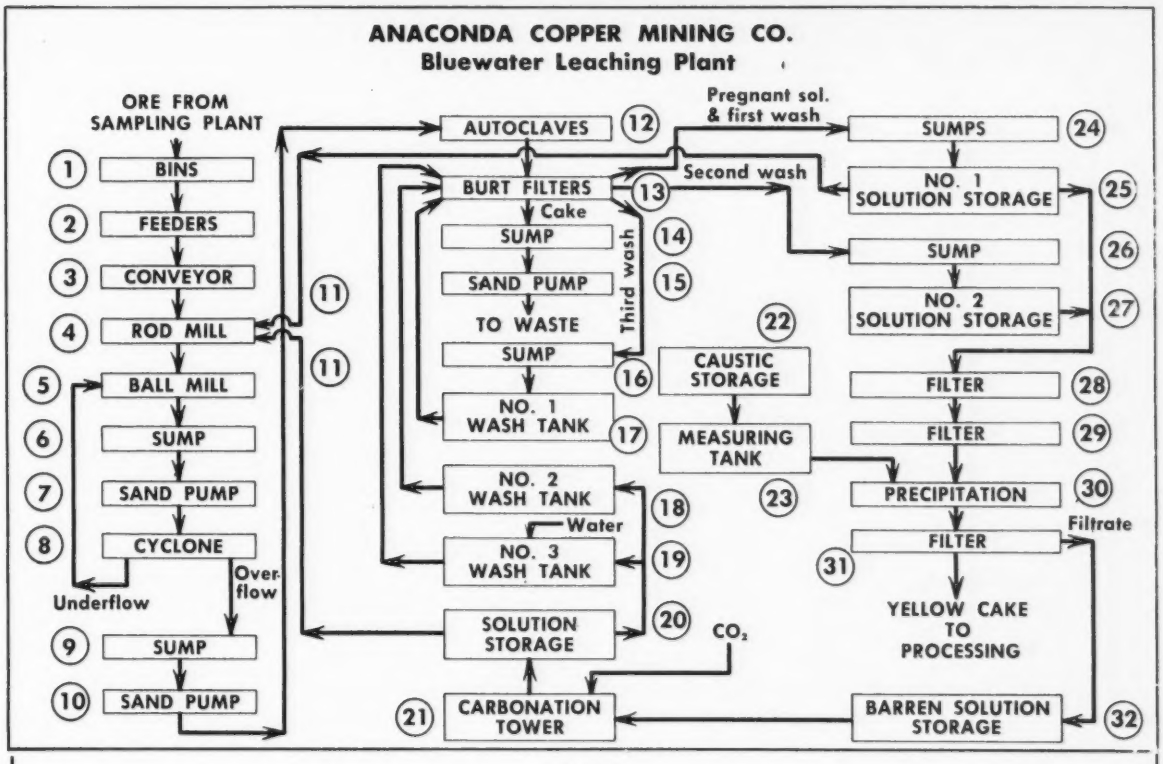
absorbed into the permanent facilities described in this article.

In so doing, Anaconda acted as agent for the AEC. Ores were purchased and stockpiled. Eventually they will be milled and the concentrate sold to the AEC on contract.

Purchase Contract

On Jan. 17, 1952, it was announced that Anaconda and the AEC had signed a contract covering purchase by the AEC, over a 5-yr period from the start of operations, of the uranium output of a processing plant Anaconda was to build at Grants. The plant was

LEACHING PLANT, treating limestone-type ores, will soon be expanded.



LEGEND

1. Three circular fine-ore bins (fourth unit, square, to bypass sandstone gangue ores to stockpile)
2. Two Transporto feeders (totalize and indicate tons of ore going to leaching plant)
3. Belt conveyor
4. Marcy open-end rod mill using 3-in. rods
5. Marcy open-end ball mill using 2-in. balls
6. Sump
7. Wilfley sand pump
8. Cyclone, underflow 5% plus 65 mesh, 59% minus 200 mesh
9. Sump
10. Wilfley sand pumps
11. Flowrators
12. Five, domed top and bottom, autoclave leach tanks
13. Five Burt filters
14. Sump (tailings)
15. Two 3-in. Wilfley sand pumps
16. Sump, steam coil heated
17. No. 1 wash solution storage tank
18. No. 2 wash solution storage tank.
19. No. 3 wash solution storage tank
20. Leach solution storage tank
21. Carbonation tower
22. Caustic solution storage tank
23. Caustic solution measuring tank
24. Two sumps, steam coil heated
25. No. 1 pregnant solution storage tank
26. Sump, steam coil heated
27. No. 2 pregnant solution storage tank
28. Plate-and-frame filter press, for clarification
29. Sock filter, for clarification
30. Precipitation tank, steam coil heated, agitated with ship-type propeller
31. Plate-and-frame filter press
32. Barren solution storage tank

POWER PLANT for Bluewater project has two GE steam turbines, coal-powered.

designed to treat limestone type ores, which are still its only feed.

Next the Jackpile

As the exploration in northern New Mexico progressed, interesting uranium occurrences were found in the sandstones higher in the geologic column than the Todilto limestone. In fact, uranium-bearing sandstone and shale-type ores had been purchased by the ACM buying depot from the first, but this type of ore has been, and is still being stockpiled because only the limestone-type ores are being treated in the present plant.

Aerial surveys, run in various leased aircraft, using scintillometers, indicated good possibilities on land that is a part of the Laguna Indian Reservation about 50 mi from the plant site.

To get permission to explore and to develop ore on these lands required a long series of tribal councils, in which the good offices of Mr. Dismuke, Indian agent, were most helpful.

Eventually Anaconda concluded a satisfactory agreement with the Laguna, and was able to begin development of the most promising showing at a point near the village of Paguate, 54 mi from the plant. This was the start of the Jackpile mine, one of the most promising properties in the Colorado Plateau, despite the fact that treatment of its ore is still awaiting expansion of Anaconda's facilities at Grants and modification of its flowsheet.

At present, about 30 producers of limestone, sandstone, and shale-type ores in Arizona and New Mexico are shipping ore to the Anaconda uranium plant. Only the limestone ore, the bulk of which is Santa Fe Haystack ore, is being treated. An expansion program, to get under way shortly, will provide facilities to treat the other types of ore as well.

Geology of Jackpile

Discovery of a strong outcrop, about 20x50 ft in size, by aerial survey, led to the Jackpile mine. The ore is in the Westwater sandstone of the Morrison formation of Jurassic age.

In the Grants area the Morrison is capped by Dakota sandstone of Lower Cretaceous age.

The Westwater is about 175 ft thick, and in the orebody itself there have been found numerous mineralized logs and bits of carbonaceous material that are believed to have influenced ore deposition. Carnotite is the chief uranium material.

Very low in lime content, the Westwater is not a homogenous bed but includes many discontinuous shale lenses. A large diabase sill cuts the Jackpile orebody, but the relationship of sill to ore, if any, is not known.

Mineralization is along minute cracks. The orebody is in bedded sandstone, elliptical in shape, and appears to have a northeast trend. All sediments here dip gently northward.

Drilling the Jackpile

Following conclusion of the contract with the Laguna Pueblo, Anaconda carried out the following exploratory work on the Jackpile.

Holes were drilled along the slopes directly about the outcrop on 15-ft centers, followed by driving three tunnels to explore the orebody. One tunnel, 10x10 ft in cross-section, was driven from the outcrop into the orebody, with raises on two diamond drill holes, to verify results from diamond drills.

The second tunnel was driven from the edge into the ore zone and three raises advanced to probe the extent of the orebody. The third tunnel to the north explored small pods of ore disclosed by previous drilling. All drill holes were sampled and Geiger-probed.

Subsequent diamond drilling directly in the Dakota formation northeast of the outcrop showed poor results. As a consequence, the drills were moved south along the Dakota rim directly above the outcrop, and holes drilled on a 50-ft grid to define the limits of the orebody. The cores taken were of NX size. In this area, all holes collared in Dakota sandstone and bottomed in Recapture Creek shale, thereby penetrating the Westwater sandstone completely. The Brushy Basin member of the Morrison formation is absent in the area.

Preparing the Jackpile

Development of the pit was done under contract by Isbell Construction Co., Reno, Nevada. The overburden, about 125 ft thick, was removed in three 30 to 40 ft benches with a Bucyrus-Erie 3-yd shovel and 10- and 15-ton Euclid end-dump trucks. A fourth waste bench and the orebody are being mined by Anaconda itself. Bench heights vary from 6 to 15 ft, depending on the thickness of the orebody (6 to 30 ft thick). Equipment used in loading broken ore for shipment to the processing plant consists of a Bucyrus-Erie 1½-yd shovel and 10- and 15-ton Euclid end-dump trucks.

Test holes to give mining limits, and the blast holes, are drilled with Winter-Weiss drills. Spacing on overburden benches is 20 ft and on ore benches 15 ft. All holes are sampled and Geiger-probed.

Processing Plant

The processing plant and auxiliary units, housing project, and airport are at Bluewater, about 9 mi west of Grants and a short distance from U.S. Highway 66. Actual construction of the plant was started in January 1952, and though scheduled to be in operation by April 1, 1953, the plant was not completed until September 1953, owing to delays in steel and equipment deliveries. Plant units include primary and secondary crushing plants, sampler, ore storage and mixing plant, leaching plant, and power house. Near the plant are the general office, warehouse, repair and maintenance shops, garage, change room, general laboratory, and airport with

hangar. At the townsite with its 28 modern 3- and 2-room dwellings, the company also maintains a 4-bed hospital. As built, the project represents a capital investment of about $4-million.

Crushing and Sampling

All shipments of ore by truck from the mines are weighed on F-M truck scales, and then unloaded on surfaced receiving pads. Next, each load is provided with two stakes containing the name of shipper, lot and pad numbers, and hand-sampled for moisture content. After a pad has been closed, the stockpiled ore lot is then put through the crushing and sampling plants (see flowsheet). The metallurgical plant and power plant were designed by Wilbur Jurden and staff, of Anaconda's New York Engineering Department. The local organization designed and built other facilities.

The fine-ore storage facilities a short distance from the leaching plant proper consist of three circular steel bins with cone-shaped tops and bottoms and a square steel bin with hopper bottom into which is dumped sandstone gangue ore preparatory to transport to stockpiles. Two Transportofeeders operating under the three limestone gangue ore bins facilitate blending of the leaching plant feed transported to the grinding section of the plant by an 18-in. (No. 4) belt conveyor.

The Leaching Plant

Leaching plant feed treated currently consists of high lime ores containing from 75 to 80% $CaCO_3$. Treatment as seen in the accompanying flowsheet involves: 1, grinding to 5% plus 65 mesh and 69% minus 200 mesh in a rod mill in open circuit and ball mill in closed circuit with a cyclone; 2, leaching of the resultant 60% solids pulp in steam-heated autoclave leaching tanks; 3, filtering the autoclave product in Burt filters; 4, clarifying pregnant Burt filter solution in plate-and-frame and sock filters; 5, precipitating clarified solution in a steam-heated precipitation tank by addition of NaOH; 6, filtering the solution from precipitation tank in a plate-and-frame filter to produce yellow cake for shipment.

Filtrate from the last-named press flows successively to a storage tank, carbonation tower receiving CO_2 from the adjacent power plant, and finally to the leach solution tank for reuse in the mill circuit. Liquors used in the plant are a mixture of 10% sodium carbonate and 1% sodium bi-carbonate.

Principal mill controls are: 1, pulp density; 2, grade of pregnant solution from Burt filters. To this end, two grades of ore can be blended with two grades of solutions (barren leach solution and weak pregnant solution) to obtain the desired concentration of U_3O_8 in the Burt pregnant filtrate. The desired rates are computed by the non-technical foremen on the grade of solution and ore change.

Radiometric assays are obtained on ore that is fed to the storage bins and these are used for mill control. Fluorometric assays of mill solutions are used for computing solution flow rates. Mill operators are currently being trained to run radiometric and fluorometric assays to give 24 hr control of mill conditions.

Leaching of the 60% density pulp from the grinding circuit is a batch operation. It takes place in five tanks with domed bottoms and tops, the charge being heated to 250 deg F by means of a steam coil and agitated with a ship-type propeller.

Leached material is filtered in five Burt filters, with three washes given during each operating cycle. Pregnant solution and first wash are collected in two sumps, steam-coil heated, for transfer to the precipitation department.

Improving the Burts

Since start of plant some improvements made locally on the Burt filter have improved operation of these units materially. For instance, the filter elements were redesigned by: 1, changing the angle of the boards at the base to eliminate mud packing and hang-ups between boards; 2, changing the solid wooden cone of the filter element to a hollow metal cone (made possible by not having any corrosion problem).

Holes drilled through the face board and cone allow the filtrate to escape directly instead of having to travel the length of the grooved face board before escaping, thereby giving better filtration rates and improving washing.

Operation of a Burt filter unit is as follows: The filter is first charged to a given level while in a stationary position. End relief and end inlet valves are then closed and the filter placed in operation. The ammeter will indicate when the charge is properly spread out in the filter. When this point has been reached, the air is turned on to position the cake, and filtration starts. Air pressure is 30 psi. Completion of the filter cycle is evinced by steam rushing from the filtrate ports. Air pressure is then reduced, the end inlet valves opened, and the first wash of given volume charged into the filter still in motion.

This procedure is repeated during the second and third wash periods. At the end of the third wash, the 30-psi pressure is cut, vacuum applied to pull cake from filter leaves, hot water added, and water and cake repulped for long enough periods to produce a slurry of a density that will discharge through the end ports of the filter and can be pumped to the tailings dump.

The barren solution from the precipitation department is a sodium carbonate and sodium hydroxide mixture. It is converted in the carbonation tower to a sodium carbonate-sodium bi-carbonate mixture by carbonation with CO_2 from the power plant gases. The reaction is:

$$2\ NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$$
$$Na_2CO_3 + H_2O + CO_2 \rightarrow NaHCO_3$$

The regenerated solution produced is then ready for the grinding circuit.

Power

Electric power for plant operations and camp is generated in the power plant adjoining the leaching plant building. It contains two steam turbines with C. H. Wheeler condensers, a Combustion Engineering coalfired boiler equipped with a chain grate stocker, and steam and electric-driven auxiliaries such as feed water pumps, fans and others. The switch gear installation is of Westinghouse manufacture. Compressed air for plant use is generated by a air compressor operating in the power plant building. In the event of a power failure or shutdown of the power plant there are available two Caterpillar D-17000, 96-kw Diesel power-generating stand-by units capable of supplying sufficient electric power to the townsite and certain components of the processing plant.

The operating staff at Bluewater includes J. B. Knaebel, manager; A. J. Fitch, Jr., general superintendent; J. P. Herndon, mine superintendent; W. J. Roberts, mill superintendent; R. D. Lynn, chief geologist; T. M. Fitch, mechanic; J. R. Pate, chief chemist; Dale Matthews, plant metallurgist; and F. G. Holmberg, chief clerk.

COMING NEXT MONTH

A complete, on-the-spot account of one of the greatest mining booms in history — the uranium hunt on the Colorado Plateau. Topics will include geology, geophysics, exploration-mining, milling, and marketing of uranium.

Information will be based on personal interviews with some of the ablest geologists, mine operators, metallurgists, and executives in the uranium field.

New Plant

ROBERT COCHRAN
Cleveland News Bureau
McGraw-Hill Publishing Company

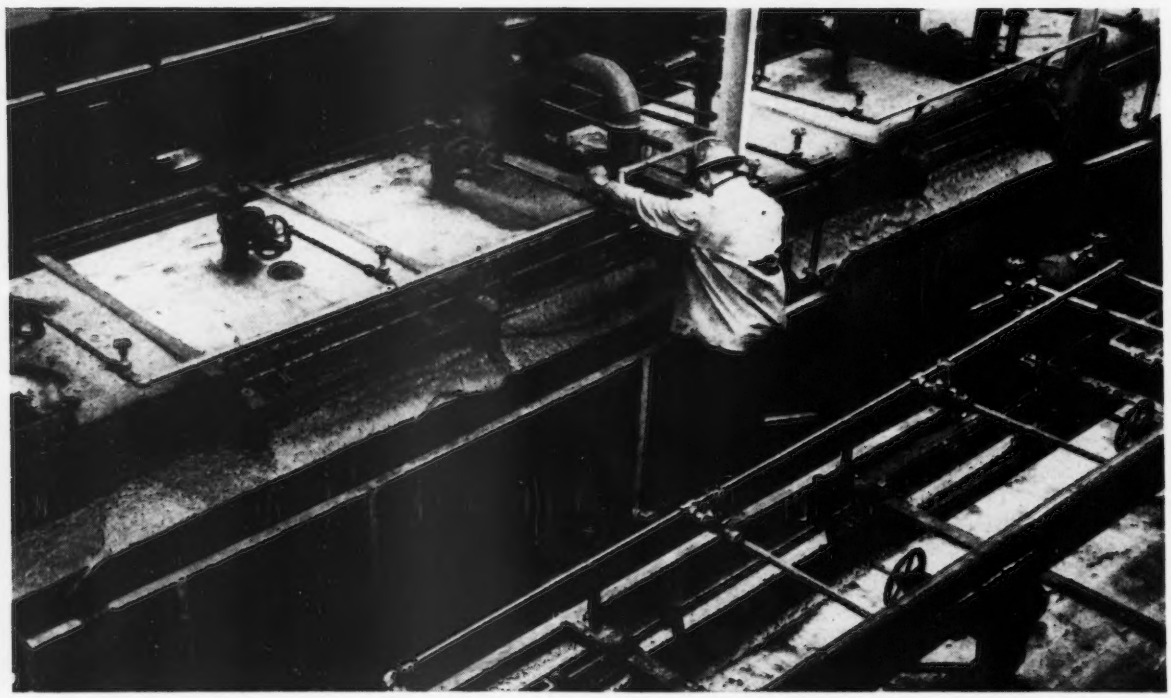
BEARDED in keeping with celebration of Ishpeming's 100th birthday celebration, Allan Kennedy, control metallurgist, checks iron froth in new Humboldt concentrator.

PRODUCTION OF RICH IRON concentrate from the jasper and taconite rock in the Lake Superior region is out of the "swaddling clothes" stage.

Last year about 620,000 gross tons were produced by Erie, Reserve, and Oliver in Minnesota in their respective taconite pilot plants.

Now, Humboldt Mining Co., owned jointly by the Cleveland-Cliffs Iron Co., Cleveland, and Ford Motor Co., has in full-time operation the first commercial plant, built as such, to produce a high grade iron concentrate from the lean jasper rock in Upper Michigan.

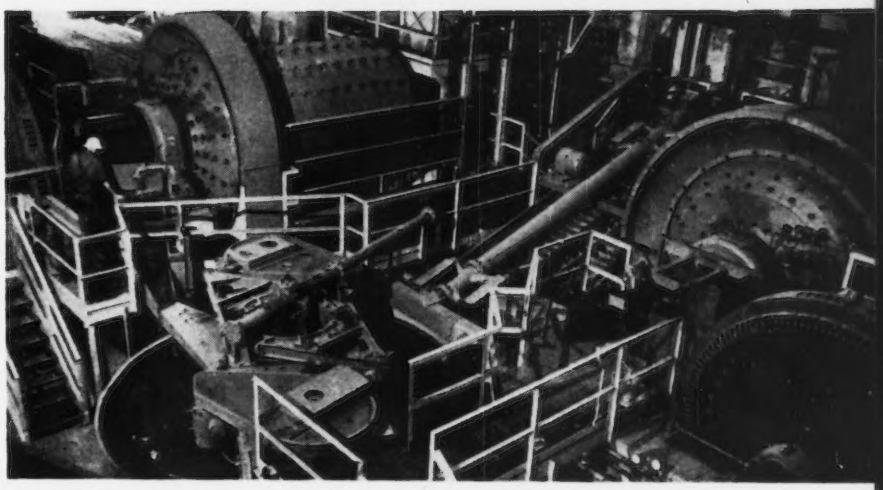
Located 13 mi southwest of Ishpeming, the long-time center of Cleveland-Cliffs' mining activities, the 250,000-ton-per-yr beneficiation plant started its shake-down test runs early this year. (See "Humboldt Iron Will be Recovered By Flotation," by D. K.



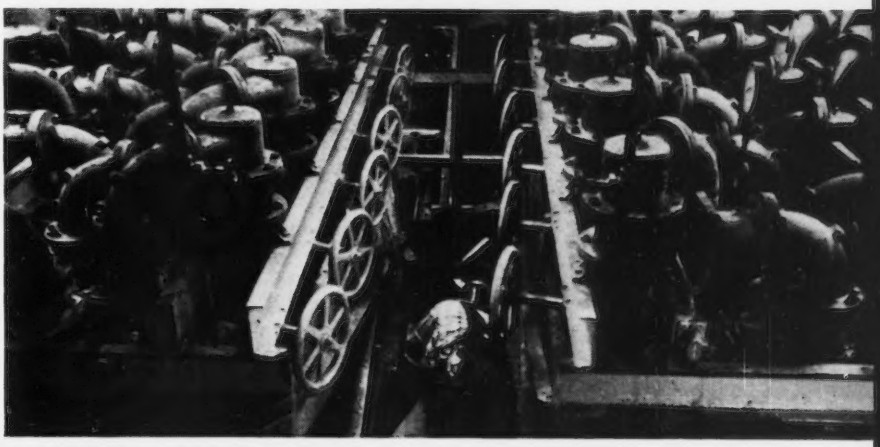
STEFFENSEN CELLS, air-agitated, do flotation job in new Cleveland-Cliffs-Ford plant. Roughing, cleaning, recleaning produce 61-63% grade on 34% feed of 48-mesh jasper ore. Operation requires careful control, uses anionic reagents.

Successfully Floats Michigan Jasper

ED NANNO
Cleveland, Ohio
(Photographs)



JASPER IS HARD, but grinding to 48-mesh liberates non-magnetic iron particles. Minus ¾-in. feed is ground in rod mill (left). Tricone-Hydroscillator (right).



DESLIMING is important in keeping down reagent consumption and yielding high grade. DorrClones do job in two stages, also do preliminary dewatering.

REAGENT CONTROL is highly important in flotation. Oleic acid is principal reagent. Recovery of iron is about 44% of original weight.

Campbell and L. J. Erck, *E&MJ* February 1953).

By May 1, the personnel training period had been completed and a few operating adjustments worked out. The plant is now in production, under the immediate supervision of Emert W. Lindroos. Grover J. Holt is general manager of mines for Cleveland-Cliffs in Michigan and Minnesota, with headquarters in Ishpeming. J. S. Westwater is manager of Michigan Mines and Harry C. Swanson, Michigan District superintendent, open pit mines.

Bulking far larger than its output, however, is this plant's importance in the years of research, engineering, pilot plant testing and financial studies that have gone into it. At last, the drive to concentrate the lean ores of the Lake Superior region is paying off.

The 175,000 tons of 60%, or richer, iron concentrate that Humboldt contributes this year, added to an estimated 1-million tons produced by the pilot and experimental plants of Oliver, Reserve, and Erie, will be about one-fifth of the tonnage of iron concentrates that will be produced by 1957. By 1970 an estimated 40-million tons of this material will be coming down the lakes.

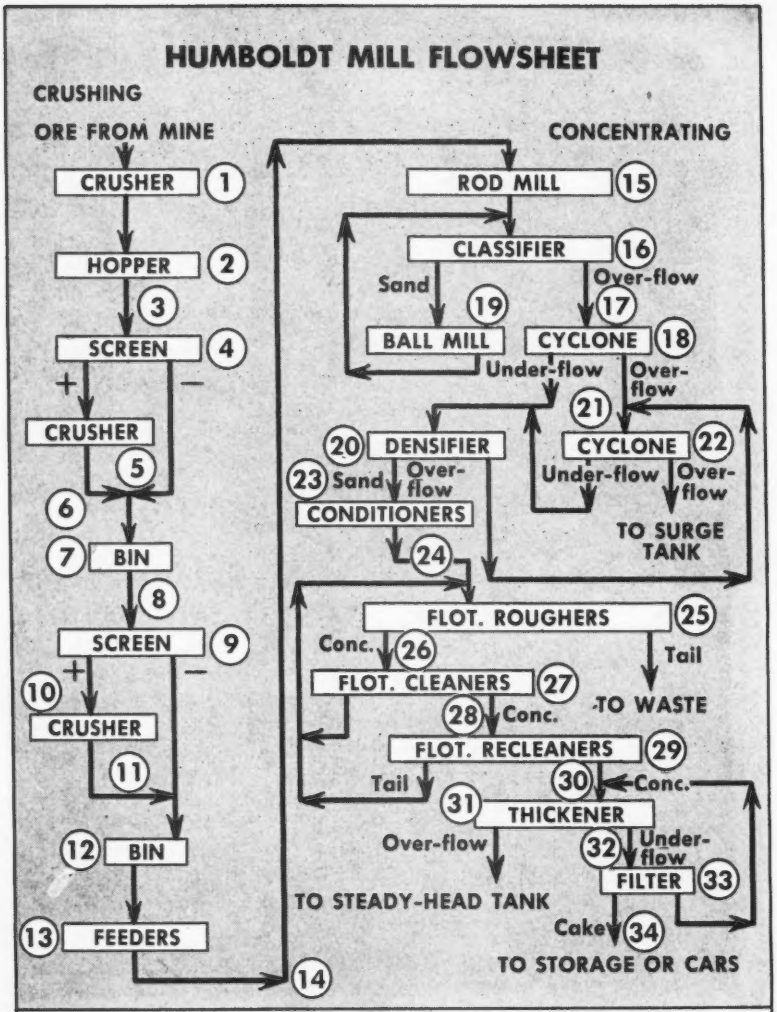
Humboldt's neat plant and its mining operation is on the site of underground mines whose rich ores have long since been removed.

Jasper, similar to what men on the Minnesota range call taconite, contains narrow bands of non-magnetic iron. It is extremely hard, but once drilled, broken, and ground, it yields its iron content readily in the form of non-magnetic flakes. For that reason, flotation, rather than magnetic separation, was chosen for the plant.

Mining the Ore

Under the supervision of Clifford Drake, pit foreman, and Albert Henry, mine engineer, the Humboldt open pit has been under development for about a year.

Producing enough ore for a mill



LEGEND

1. Primary crusher—48-in. Allis Chalmers gyratory, 8-in. discharge.
2. Surge hopper, 40 tons, Ross chain feeder on discharge.
3. Buffer belt, plus conveyor and tramp iron detector.
4. Ty-rock double-deck screen, 6x12-ft, discharge at 4-in. and 2-in.
5. Secondary crusher, Symons, 7-ft standard.
6. Buffer belt and two conveyor belts to bin.
7. Surge bin, 150-ton.
8. Belt feeder.
9. Ty-rock double-deck screen, 6x14-ft, 1-in., ½-in., and minus ½-in.
10. Tertiery crusher, Allis-Chalmers 5-84.
11. Belt conveyor and Merrick Weightometer.
12. Fine ore bin, 1800 long tons.
13. Belt feeders.
14. Belt conveyor system, including reversible belt to feed experimental rod mill during tests; final belt passes through Toledo Chronoflo.
15. Hardinge rod mill, 9x12-ft.
16. Dorr Hydroscillator, 65-mesh separation.
17. Hydroseal pump, 8-in.
18. Primary cyclone, 24-in. DorrClone.
19. Hardinge Tricone ball mill, 11x7-ft.
20. Wemco spiral densifier.
21. Two Hydroseal pumps, 8-in.
22. Secondary cyclones, 24 DorrClones, 6-in.
23. Three conditioners in series, 4x4-ft., followed by sampler.
24. Hydroseal pump, 6-in.
25. Two banks, 6 cells each, in parallel, Steffensen pneumatic cells.
26. Hydroseal pump, 6-in.
27. Two banks, three Steffensen cells each, in parallel.
28. Hydroseal pump, 6-in.
29. Two banks, two Steffensen cells each, in parallel.
30. Hydroseal pump, 6-in.
31. Dorr thickener, 30x8-ft.
32. Hydroseal pump, 4-in.
33. Two Eimco drum filters, one in use, one stand-by.
34. Two belt conveyors to storage.

feed of about 1700 long tons daily, the mine is of special interest because of its use, for the first time on the Michigan ranges, of a Linde jet-piercing rig for blast hole work.

Along with the constant experimentation needed with a new method like jet piercing, the mine staff is testing and revising every phase of the mine's operations. Therefore, what follows by the way of discussion of the mine must be regarded as subject to change. The present pit is not yet large enough, nor well enough established, to permit final decisions on mining methods.

However, enough has been done to show an interesting pattern, for example on the jet piercing. In operation since April 22, the jet piercer can put down about 20 ft per hr of 9-in. hole at Humboldt in good ground.

By "good ground" is meant hard rock that spalls readily and that is relatively free of fractures and joint planes. Unfortunately, the Humboldt orebody, or at least the upper portion now being mined, is not free of fractures, and when the jet piercer meets a large fracture, progress becomes much slower, sometimes as low as 6 ft per hr. The average is expected to be much higher, probably nearer the 20-ft level.

As a comparison, it should be noted that churn drills in the same ore put down only about 4 to 5 ft per shift of 9-in. hole. It was a rare thing for a churn drill to run as high as 6 ft per shaft, whereas it is unusual for the jet piercer to drop as low as 6 ft per *hour*.

Holes are 43 to 44 ft deep, extending about 4 ft below grade on the 40-ft benches used in the Humboldt pit. Burden is usually 20 ft; holes are spaced 18 to 20 ft. At points where shorter holes must be drilled, spacing drops to about 15 ft. Actually, the pit is in such an early stage of development, the pattern of hole spacing that can be maintained has yet to be worked out.

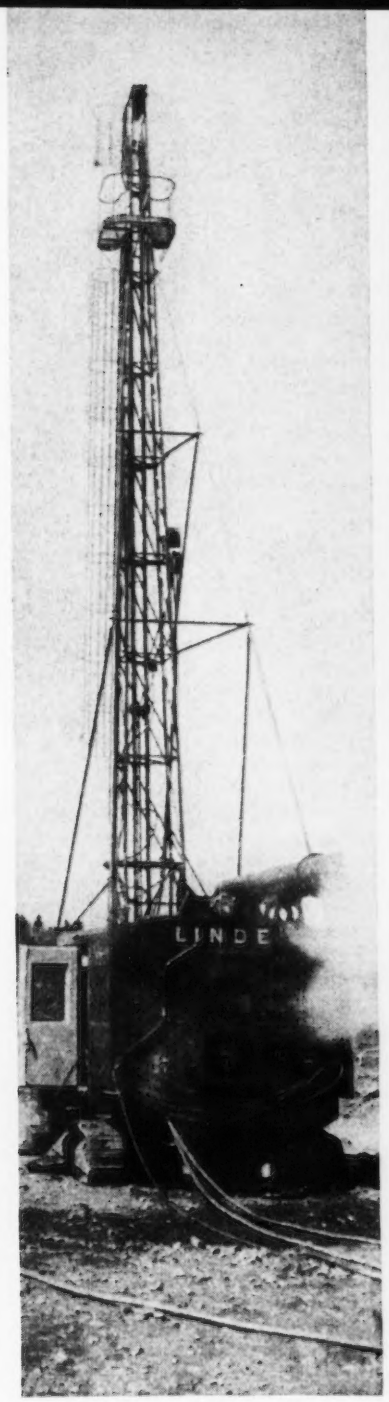
Oxygen Supply

One characteristic of jet piercing which proves interesting is the uneven-

Please note:

Since the flowsheet at left was sent to the printer, the following changes have been made in the plant:

1. The cyclone (No. 22) underflow now goes to densifier overflow.
2. The cyclone (No. 22) overflow goes to waste.
3. The thickener (No. 31) overflow goes to the 6-in cyclones (No. 22).
4. The Hydroscillator separation (No. 16) is at 48 mesh.



JET-PIERCING RIG puts down 40-ft, 9-in holes for blasting jasper.

FINAL THICKENING to 70% solids prior to flotation is done in Wemco densifier. Feed to flotation is diluted about half. Quality and costs are improved.

FINAL CONCENTRATE of non-magnetic iron is filtered on Eimco drums using Saran filter cloths. Moisture content comes down to 7.2%.

ness of the hole produced in this type of rock. This characteristic has been noted in other operations using the jet piercer in iron formation. The holes are not of uniform diameter but consist largely of rings of high iron content forming the minimum diameter; seams of jasper burned out to a larger diameter. This characteristic has made it necessary to work out proper loading of these holes.

Oxygen comes to Humboldt in 1-million cu ft tank cars from which it is unloaded into a Driox storage unit having a capacity of 310,000 cu ft. A 4-in. pipeline carries the oxygen about 1200 ft to the pit area. Then there is a 2½-in. line about 300 ft into the pit, followed by two 300-ft sections of 1½-in hose to the machine, delivering oxygen at 150-lb pressure. The machine uses 10,000 cu ft of oxygen per hr. It requires 1200 gph of water, and about 275 gal per shift of No. 2 fuel oil. The reamer shell lasts about 2 holes. Practice is to make a second pass at the bottom of the hole to ream out a chamber about 4-ft high and 10-in in diameter. Loss of oxygen ahead of the machine is estimated at about 4%.

Back-break is an important factor at Humboldt. Care must be observed

Table I—Typical Metallurgical Results of Flotation Treatment of Hematite Ores, Humboldt Plant, The Cleveland-Cliffs Iron Co., Ishpeming, Mich.

Product	Weight, %	Iron %	SiO_2 %
Concentrate	44.38	62.63	8.38
Flot. tailing	48.79	8.51	
Sec. cyc. O'flow (slime discard)	6.83	30.63	
Heads	100.00	34.04	

to have a light burden at the toe of the bench, or severe back-break will occur upward at a flat angle from the row of blast holes. Tests are being run to see if a row of shallow holes drilled just behind the last main row of holes would act to cut down back-break.

Wagon drills are used to drill toe holes where more than an 18-ft burden must be left. The rock tends to break along fracture systems, and tests are being run to see if jackhammer holes about 4-ft deep, drilled around the main holes in areas that seem likely to break as a block might relieve this condition, if fired at the same time as the main holes. It is believed that the present fracture zones are largely limited to the upper part and south end of the pit now being mined.

Approximately one third of the powder used goes in the bottom 4-ft of chambered hole. This means a density of 50 lb per ft in the bottom. Above the chambered hole the powder density would be 17½ lb per ft, decreasing toward the top through 15 to 12½ lb per ft. The upper 8 to 12 ft of hole is filled with stemming.

Hercules powder of two general types is used; one an ammonium nitrate-base powder of which 6-in, 5½-in. and 5-in. dia cartridges are used, and the other a free-pouring modified TNT pellet. These are used together to get the varying powder densities mentioned previously. Deck loading is thus avoided.

Holes are fired with Primacord, and various delay arrangements are being tested using 17 millisecond connectors. Large chunks are drilled and blasted as they accumulate, but tests will be run with a drop ball as a secondary blasting substitute.

Loading & Haulage

A P&H 1500 series, 4-yd electric shovel loads broken ore. A Bucyrus-Erie 54-B, 2½-yd electric shovel is also used. The truck fleet includes at present four 22-ton and two 34-ton Euclids, including spares and stripping units. Haulage at present is a little over 1000 ft, up an 8% grade to the crusher.

The mine and crushing plant now work one shift a day, supplying one mill unit operating on a three-shift schedule, with 1680 tons per day. Three such units were planned.

Milling the Ore

The Humboldt mill is noteworthy for its use of flotation to recover the iron mineral, for its use of the Tennessee Copper type of grinding circuit, and for its use of cyclones for desliming. The accompanying flow-sheet shows the equipment used.

Jack Myers, for many years mill superintendent at Tennessee Copper Co., served as consulting engineer in designing the Humboldt mill. The technical committee responsible for plant design consisted of L. J. Erck, D. K. Campbell, Emert Lindroos, all of Cleveland-Cliffs, and Mr. Myers. O. W. Walvoord, of Denver, was the primary contractor.

As shown in the flowsheet, the grinding circuit consists of a 9x12-ft Hardinge rod mill, an 11-3-6-10 Tricone ball mill, and a Dorrco Hydroscillator, all run in approximate agreement with the methods developed by Jack Myers and F. M. Lewis at Tennessee Copper. It is interesting to note that apparently the circuit grinds as effectively in Michigan as it does in Tennessee.

The chief objective was power economy, considerably less power being required than if a standard type of grinding circuit would have been used. About 780 hp is now taken by rod and ball mills. The grind is from about ¾-in. entering the rod mill to minus 48 mesh feed to flotation.

Actually, there is a definite spread between coarsest size of gangue and iron minerals leaving the Hydroscillator, which is one of the advantages offered by this machine. Few mineral grains are coarser than 100 mesh; the coarsest grains of gangue are 48 mesh. The Hydroscillator also makes an unusually clean separation, there being about 97.5% of plus 200-mesh material in the sands, for example.

Freezing a Problem

Operating in winter is a problem for any mill in the northern latitudes, and at Humboldt, the problem is no different. Large chunks of ore come in chilled through and through. On days when the temperature hovers around freezing and some of the smaller rock fragments are covered with icy water, these fragments freeze instantly when they hit the sub-freezing cold of the chunks. The solution to this problem has been worked out and alterations will be made before freezing weather arrives in 1954.

Desliming in Cyclones

Desliming, done by cyclones, is necessary to prevent excessive consumption of reagent in flotation and to make possible a high grade of concentrate. As the flowsheet shows, the cyclones operate in two stages. Pressure on the first cyclone, a 24-in. Dorrclone, is 15 psi. Pressure on the second-stage cyclones, (twenty-four 6-in. Dorrclones) is 40 to 49 psi.

The aim here is to eliminate the minus 5-micron slime. Actually the split has to be made at about 20 microns. The weight loss in the slimes is under 8%. It usually averages around 5%, and it is hoped to get it down to less than 4%.

The cyclones thicken the pulp considerably, but a further thickening is necessary prior to flotation. The densifier takes care of this, producing a pulp thickened to about 70% solids.

In the conditioners, a most important step, density comes down to about 65%, and the pulp is diluted to about 35 to 40% solids prior to flotation.

Economical Flotation

For a long period of testing, the Cleveland-Cliffs staff felt that a fairly complex and expensive reagent scheme would be needed for the Humboldt ore. Eventually, the technical committee already mentioned, aided by Allen Kennedy, metallurgist, approved the comparatively inexpensive system now used.

Briefly, the shape of the grains of specular hematite, the chief ore mineral, is such as to permit use of red oil, high in oleic acid, as the only flotation reagent. On ordinary hematite, oleic acid would fail because of excessive slimes. Occasionally, mineral oil and a frother have been used to supplement the oleic acid. Consumption is

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Feed to the system is 650 to 750 tons per day and gas production 26,000 to 30,000 C.F.M. Gas strength averages 8 to 12% representing a sulfur recovery of 98%. Unusual? Yes, because this is the first time that low grade sulfur ore could be recovered as SO_2 . . . economically. Here's how the system works . . . ore averaging 28% total sulfur is crushed to 10 mesh and fed dry to the Reactors which operate in parallel. Once ignition temperature is reached no extraneous fuel is needed. Ore is simply fed in at the design rate, latent heat in the bed immediately brings it to ignition temperature, and the fluidizing air oxidizes the sulfur to SO_2. Shutting down is a matter of minutes. And because the fluid bed stores sufficient heat, roasting can be started again after as much as 72 hours without adding additional fuel.

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WASHINGTON IMPACT

Morton A. Reichek, McGraw-Hill Washington News Bureau

Malone Subcommittee Report Hits Reliance On Overseas Sources of Critical Materials

AFTER 10 MONTHS OF HEARINGS, with testimony from over 360 witnesses, the Senate Minerals, Materials & Fuels Economic Subcommittee, headed by Sen. George W. Malone, has published a 380-page report (available from the Superintendent of Documents, Government Printing Office, Washington, D.C., $1.75). It reads like an encyclopedia on Government-mining industry relations, and covers much of the same ground reviewed by the Paley Commission two years ago —but with fundamentally different conclusions.

The Subcommittee's task was to determine the "accessibility of the critical raw materials to the U.S." during wartime, then "recommend methods of encouraging the production of the critical war materials adequate for the expanding economy and the security of the U.S."

Its main conclusions are that "the Western Hemisphere can be defended and will be the only dependable source to the U.S. of critical raw materials in the event of an all-out war," and that "during the last more than a quarter of a century, established procurement practices have dangerously increased our dependence for the critical materials upon nations across major oceans."

In line with its findings, the Subcommittee made these major recommendations: (1) abandonment of the Reciprocal Trade Program; (2) a U.S. mineral policy based on Western Hemisphere self-sufficiency; (3) increased depletion allowances to miners as a further incentive to production; (4) accelerated Government metal stockpiling; (5) an investigation into SEC control on mining securities; (6) repudiation of all "international controls on production, prices, and supplies of critical materials;" (7) $50-million annual appropriations for a five-year Government research program on improved beneficiation methods and substitutes and synthetics; and (8) a titanium expansion goal of 150,000 tons annually.

Included in the report is a vehement attack on the State Department's role in matters affecting the domestic mining industry. Through "the responsibility to formulate trade agreements—(the Department) has had a life and death power over our domestic mining—industry for two decades," the report states. State Department personnel "placate foreign powers . . . by entering into trade agreements . . . giving them benefits and advantages through division of our markets, encouraging these powers to build up their production of strategic and critical raw materials which work to a disadvantage and at the expense and destruction of our domestic industries and thus weaken the security of the nation."

Stemming from this attack, a rider in State's new appropriation bill cuts off funds for the Department's 10-man metal and mineral staff. This action is rather short-sighted, according to some observers, because State still retains responsibilities in matters related to mining, and these may now be handled by personnel with even less knowledge and sympathy for mining problems than the former staff's.

The Malone Subcommittee claims that other recent developments, and far more significant, also stem from its investigation: higher mine depletion allowances (see below); the Administration's new stockpile policy, boosting goals and providing preference for U.S. miners; and progress on the Government-supported titanium expansion.

Next year, the Subcommittee plans to promote increased appropriations for mineral research. The Malone report cites the following as among the most important research needs: (1) development of substitutes or synthesis for amosite and crocidolite asbestos, corundum, industrial diamonds, mica, crystal-radio grade quartz, and talc; (2) laboratory work on Cuban chromium deposits and exploration of such known deposits as the Oregon beach sands; (3) investigation of columbium-tantalum potentials in Brazil; (4) recovery of fluorine from phosphate rock; (5) beneficiation methods for low-grade graphite and manganese, and (6) prospecting for nickel in Alaska.

High Mine Depletion Rates

The new tax law provides increased depletion allowances for almost 30 minerals—copper, molydenum, iron, gold, and silver included. Rates have been boosted from 15% in most cases to 23%.

In view of the tariff setbacks so far and industry's dissatisfaction with the way the new stockpile program has been handled, some mining observers here look at the increase in mine depletion allowances as this year's most important mining development out of Washington.

But the higher depletion allowances will appear hollow to lead and zinc producers with low profit margins. The new rate is significant only to high profit mines. At current prices, a miner would have to net at least 4.6c a lb on zinc, 3.2c on lead, to use the new depletion allowance, according to a tax expert's estimate.

While the law now allows a deduction of 23% of gross income as a depletion allowance, the deduction cannot exceed 50% of net income. In other words, if 50% of a miner's net is less than 23% of his gross income, then the 50% figure rules as the basis for tax computations.

Copper, molybdenum, iron, gold, and silver were omitted from the increase because the Treasury Department claimed the revenue loss would be excessive if the higher mine depletion rate were allowed without restriction.

Government Mercury Buying

Last month's GSA announcement of a new mercury purchase program helped compound the mystery of the Government's interest in mercury during the past half-year. The program provides for government purchase of 125,000 flasks of domestic mercury and 75,000 flasks of Mexican metal at $225 a flask by Dec. 31, 1957. It also authorizes individual contracts with Canadian producers.

An ODM official says the goal is not the precise amount of mercury the government expects to put its hands on; it was set that high only to provide long-range price stability in mercury as a stimulus for new U.S. and Mexican production.

Some miners have already complained to Washington that $225 is not an adequate floor price. ODM says it may boost the price if miners "can present evidence" supporting their claim. There's a precedent for such a move; the agency once hiked its purchase price on manganese.

There is still no official explanation for the Government's interest in mercury. Washington officials are tight-mouthed about why the Government has procured so much mercury since last fall and why it is now necessary to set a guaranteed price to spur more output.

But two theories are floating around: (1) a new use for mercury has been discovered in the Atomic Energy Program; (2) the program has been developed to aid foreign economies that have nothing

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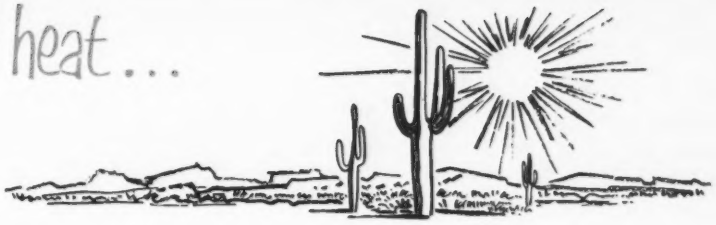
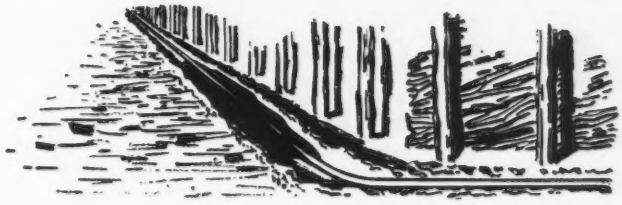


Pull it over rocks and shale...

Trench it in presence of acid water...



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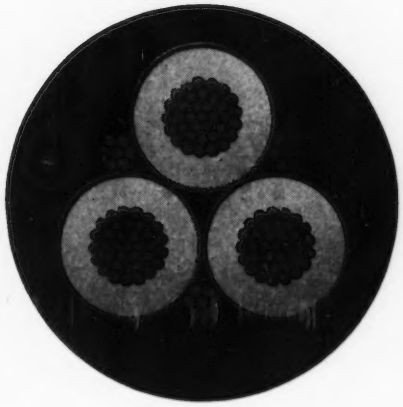

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One ODM official, however, frankly says the mercury program "is not a consequence" of the new stockpile policy, and that behind it is "an immediate defense need, not for stockpiling but for actual consumption."

The speculation about Atomic Energy needs for mercury was prompted by a recent unclassified Bureau of Mines report which revealed that mercury has been used in one of four experiments for "appraising the prospects for private industry participation in the . . . production of electrical energy and fissionable materials from reactors."

The conflicting theory is voiced by a Congressional mining expert who calls mercury a "convenient commodity" the Administration is using to dramatize how it is aiding domestic mining without tariff relief. This theory, however, does not explain the Government's heavy purchases of European mercury before announcing its domestic purchase program.

Despite GSA's projected $225 floor on domestic mercury purchases, prices rose from $280 to $290 during July, reflecting a prevailing tight spot market situation.

Criticism on GSA Programs

There's a gimmick in GSA's purchase programs other than mercury,—tungsten, manganese, chrome, mica, beryl, asbestos, and columbium-tantalum, that has recently come to light and has aroused considerable criticism.

Periodically, GSA publishes figures on tonnages that have been delivered to its depots under these programs, and the tonnage targets that have been set for each mineral. The most recent report, for example, announced that 4.6-million lb of columbium-tantalum concentrates have been bought as of June 30 out of the 15-million lb authorized for the program.

From these figures you would assume that GSA will still buy 10.6-million additional lb of columbium-tantalum concentrates until the program closes in 1958. But this isn't really the case. Unrevealed in the report are prior commitments made by GSA with certain producers to buy specific quantities. GSA has told the producers that these amounts will be kept open under the program for six months.

Critics of this GSA practice concede that such a market guarantee is vital to a producer opening a mine only on the basis of the purchase program. The criticism is aimed solely at GSA's failure to announce the specific commitments in addition to the quantities already delivered. Says one critic: "Theoretically, this gives GSA a loophole for not buying anything."

Another criticism made of GSA's reporting on purchase programs is the omission of date limitations—ranging from June 1957 to December 1958,—from the report. Failure to emphasize concluding dates, one mining executive complains, misleads many miners to believe that the government is committed to buy the seven minerals indefinitely until tonnage targets are achieved.

LABOR THIS MONTH

Alan E. Adams, McGraw-Hill Washington News Bureau

COURT CRIPPLES NLRB ANTI-RED PROGRAM: A lower court holds that the National Labor Relations Board is powerless to punish unions led by convicted Communists. The decision capped a series of legal defeats dealt the Board in its attempts to prevent Red-led unions from using Board services.

"This really gives us a bloody nose," says an NLRB aide about the court order preventing the Board from taking action against the International Fur and Leather Workers Union. After union president Ben Gold was convicted as a Communist, the NLRB ruled the union out of compliance—barring its agents from Board processes. A district court judge ruled the NLRB action out of order. This means the labor agency is confined to simply processing the non-Communist oaths filed annually by all union officials, even though they may be proved to be false.

Mine, Mill and Smelter Works Union will probably escape a proposed NLRB crack-down as a result of the court decision. The Board sought to show Communist connections of MMSW secretary-treasurer Maurice Travis at a time he took the Taft-Hartley oath. But it appears that this too has struck a dead end.

THE BATTLE GOES ON; A STRATEGY SWITCH: With the ineptness of current laws to effectively control Communist union leaders becoming obvious, top labor officials have joined Congressmen in a new approach.

The idea—backed solidly by AFL president George Meany and CIO president Walter Reuther—is to set up an industry-labor-government commission that will work out a sure-fire program for Congressional action early next year. This is getting support on Capitol Hill.

The effect of the program, if it's adopted, will be to delay action this session on new bills designed to remove suspect unions from operating in sensitive defense areas.

MINE-MILL STRIKE TALK DISCOUNTED: Despite threatening strikes throughout the non-ferrous mining industry, the betting is that Mine-Mill leaders will come to terms on a new wage settlement this year. The nationwide strike vote is viewed as a bargaining maneuver.

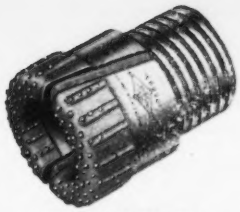
Just what the wage agreement will be is still up in the air, but it's expected to be more than the first offer of four cents. Probably, the final terms will be close to the agreements reached in the basic steel industry: five cents in wages, another nickel in fringes.

INTER-UNION RIVALRIES DYING OUT: Mine-Mill faces only two challenges by rival unions seeking to take over their bargaining rights. One involves the CIO Steelworkers—who were resoundingly defeated in previous maneuvers earlier this year—at the Empire Zinc property at Gilman, Colo. The CIO Auto Workers and AFL Machinists are trying to take over at Torrington, Conn.

Mine-Mill leaders are convinced they can win both battles in NLRB representation elections. But they recently lost one test with the steel union, which took away MMSW bargaining rights at the Republic Steel Corp. mines in Birmingham, Ala.

A MINE UNION MERGER? MMSW chieftains are more receptive now to an affiliation with AFL or CIO. Much of the bitterness against both federations has diminished within Mine-Mill ranks as a result of the union's successful program against raids by the two organizations. However, any merger will have to be on MMSW terms, letting it remain as a separate unit.

The AFL and CIO most likely won't accept the deal. Either one would require that present Mine-Mill leadership be purged, with all left-wing tinges eliminated. That UMMSW wouldn't comply is evidenced in its staunch defense of two officials under charge of Communist Party affiliations. They are appealing the conviction of international representative Clinton E. Jencks for falsely swearing about his Red connections.



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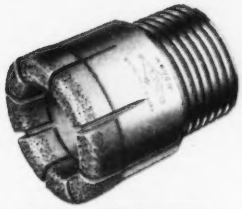

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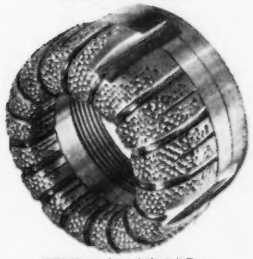
TRUCO
REAMING SHELLS



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The Charm of Booie, The Witch Doctor

Booie, the Kaffir witch doctor, didn't want to part with the charm. Often he had made big magic with it in his ceremonial dances and without it he might lose face. And, didn't it have miraculous powers?

Schalk van Niekirk, the old Boer trader, thought so—at least it had the power to make him a very wealthy man, for this pebble was four times the size of the one he had sold two years before.

So, all day long they haggled and Schalk brewed pot after pot of Dutch coffee, heavy with sugar, well flavored with a magical potion from a stone bottle and served it with the free hand of a man who feels a fortune tickling his fingertips.

Finally, he stood up, stamped out the fire and said, "Booie, come to my kraal and I will give you 500 sheep, 10 oxen, and a horse—I have nothing more." Booie held out his hand; suddenly, he was incredibly rich.

Schalk sold the big diamond—it weighed 83½ carats—for $56,000, a handsome fortune in 1870. In London, after cutting to 46½ carats, it proved to be of the finest color and brilliance, and the Countess of Dudley gladly paid $125,000 for it. In her tiara it became "The famous Dudley Diamond."

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 (*Continued from page 69*)

U. S. Mine Production of Zinc

(Bureau of Mines)

Monthly average production of zinc at U. S. mines for 1953, and totals for March, April and May of 1954, in tons:

	1953 (monthly average)	March 1954	April 1954	May 1954
East of the Mississippi:				
S. Illinois & Ky.	464	453	447	424
N. Illinois & Wisc.	2,165	1,838	1,553	1,619
N. J., N. Y., and Va.	9,481	10,422	9,821	9,337
Tennessee	3,191	2,529	2,367	2,366
	15,301	15,242	14,188	13,746
West Central States:				
Kansas	1,133	923	818	1,080
Missouri	854	679	593	333
Oklahoma	2,788	3,860	3,452	3,710
	4,775	5,462	4,863	5,123
Western States:				
Arizona	2,275	1,813	1,773	1,860
California	442	3	3	8
Colorado	3,142	2,932	2,727	2,530
Idaho	5,252	4,440	5,400	5,060
Montana	6,687	6,280	6,180	6,510
Nevada	488	30	50	90
New Mexico	1,150	1	1	.....
Utah	2,308	2,979	2,870	2,450
Washington	2,741	2,070	1,890	2,030
	24,485	20,548	20,894	20,538
Totals, U. S.	44,561	41,252	39,945	39,407

U. S. Tungsten Supply

Domestic production of tungsten concentrates in the first quarter of 1954 reached a new high for the post-war period. Salient statistics of the Bureau of Mines, in thousands of pounds of tungsten, follows:

	Production	Mine Shipments	General Imports
	(Average Quarterly)		
1950....	991	1,147	2,086
1951....	1,478	1,493	1,883
1952....	1,808	1,811	4,246
1953....	2,248	2,228	7,180
	(First Quarter)		
1954....	2,595	2,453	6,911

U.S. consumption in the Jan.-Mar. quarter was 1,399-thousand pounds, against an average of 1,934-thousand per quarter in 1953. Industry stocks at the end of the first quarter totaled 4,039-thousand pounds, against 4,647-thousand pounds on Dec. 31, 1953.

Republic of Korea supplied 2,468,-281 pounds of tungsten contained in ore in the first quarter. Bolivia shipped 1,490,929 pounds in the same period.

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated, tons of 2,000 lb. unless otherwise noted.

MISCELLANEOUS METALS

July 31, 1954

Aluminum ingot, 99 plus percent, lb.	21½¢
Antimony, spot, lb., less than carload, in cases	31.97¢
In bulk, carload lots, f.o.b. Laredo	28.50¢
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$1.70
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.18
Cobalt, 97 to 99 percent, per lb.	$2.60
Germanium, lb.	$295.00
Indium, troy oz.	$2.25
Lithium, lb., 98 percent	$11.00 @ $14.00
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	60¢
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	27¢
Palladium, troy oz.	$21.00
Platinum (Official quotation wholesale lots) troy oz.	$84.00 @ $87.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$290 @ $293
Selenium, 99 plus percent, lb.	(b)$5.00 @ $6.00
Silicon, minimum 97 percent, carloads, lb	18¢
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 99.3 plus, grade A, lb.	$4.72

(a) Includes U. S. duty. (b) Depending on quantity.

METALLIC ORES

Beryllium Ore, imported, 10% BeO per short ton unit	$42.00
Chrome Ore per long ton, f.o.b. cars Atl. ports, dry:	
44% Cr_2O_3 no ratio	$21.00 @ $22.00
48% Cr_2O_3 3 to 1 ratio	$44.00 @ $49.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$10.30
Mesabi bessemer	$10.05
Mesabi, non-bessemer	$9.90
Lead (Galena), 80 percent, Joplin, Mo., ton	$173.45
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties 98c @ $1.00 c.i.f. U. S. ports, duty extra. Long-term contract nominal at 85c. to 88¢., c.i.f. duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60¢
Columbium-Tantalum, per lb., combined oxides	$3.40
Tungsten Ore, per unit of WO_3:	
Foreign 60 percent, c.i.f. U. S. ports, duty extra	$24.00 @ $24.50
Domestic, scheelite, 60 percent f.o.b. mill	$63.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31¢
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$64.00

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	5½¢
Cobalt Oxide, 72½% to 73½%, ceramic grade, per lb.	$1.96 @ $1.97½
Copper Sulphate, 100 lb.	$10.35
Germanium Oxide, lb.	$142.00

ALLOYS

Ferrochrome, 65 to 69 percent, per lb. of Cr contained	24¾¢
Ferromanganese, 74-76%, net ton, seaboard	$200
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent per lb. of contained Si	12.4¢
Ferrotungsten, 75 to 80 percent, lb. of W contained	$3.80
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, Max. 1½ percent carbon, lb. per contracts	11.4¢
Spiegeleisen, per long ton, 19 @ 21% grade	$86.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$321 @ $514
Shingle fibers	$150 @ $200
Paper stock	$109 @ $137
Waste	$77
Shorts	$35 @ $70
Asbestos, f.o.b. Vancouver, B. C. (U. S. funds):	
Spinning fiber, 3-K	$460
Shingle fiber, 4-K	$185
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $162.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.40
Refuse or Shorts	$34.00 @ $63.00
Barytes f.o.b. cars:	
Georgia, crude, per ton	$15.00
Missouri, 94 percent $BaSO_4$, per short ton	$13.25
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $5.00 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.05
Domestic, abrasive, 80 to 84 percent	(a)$18.00 @ $18.50
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, 70% effective, ton	$34.00 @ $35.00
60% effective CaF_2	$30.00 @ $32.00
Acid 97% concentrate, bulk, ton	$52.50
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$38.00
Mica—Domestic, f.o.b. mines. Punch 12 to 22¢. per lb. according to size and quality. Sheet clear, 1½ x 2 inch, 70¢. to 85¢.; 2 x 2 inch, $1.10 to $1.60; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet, ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton Scrap $25 and up.	
Ocher, Georgia, ton, in sacks	$26.50 @ $30.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$25.50 @ $27.50
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$13.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Normal.

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces	$56.00
Steel f.o.b. Pittsburgh, billets, net ton	$64.00
Structural shapes, 100 lb.	$4.25

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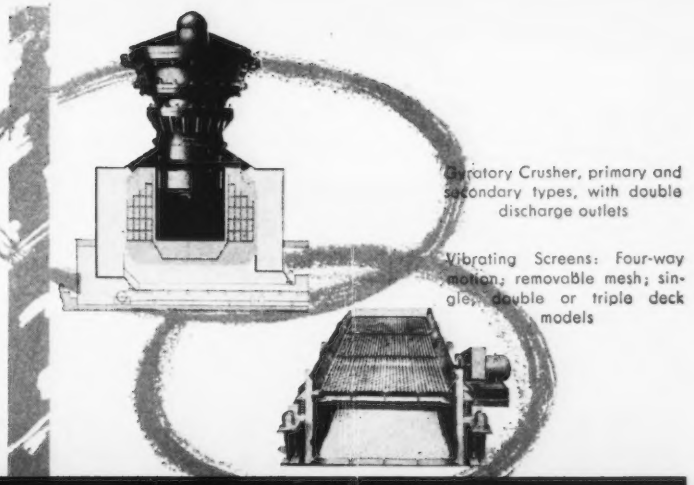

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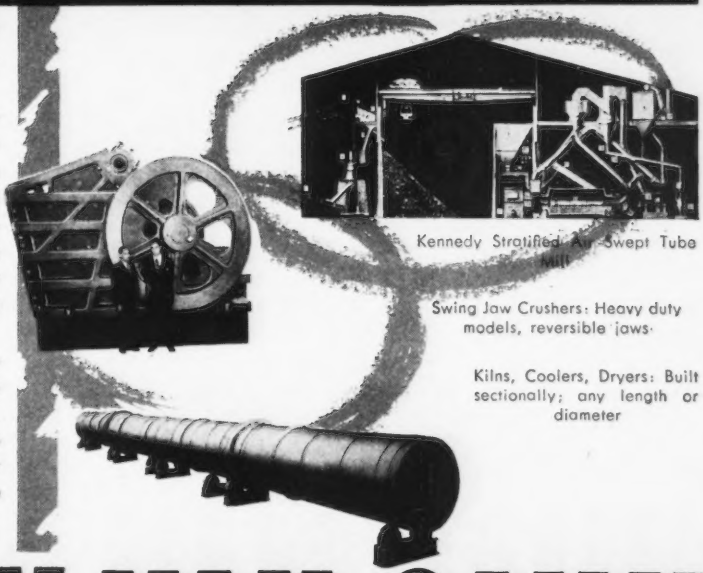

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A COVER COMES TO LIFE—Theodore L. Van Gorp, veteran illustrator of the McGraw-Hill Art Department, is shown making the scratchboard drawing for this month's unusual *E&MJ* cover. Using a photograph of the open pit at Weed Heights (shown on p 74) as his model, Van Gorp etches lines on black-painted portions of a white clay coated board. With delicate engraver's tools he gives the drawing the quality of an old woodcut. Photoengraving plate of this drawing provides the blacks and whites. Second plate is made from a tinted acetate overlay, which Van Gorp also scores for "white" printing. This plate prints the copper ink (and it's real copper) on the cover. Third printing, with a third plate, puts blue title box in upper left corner of the completed page.

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(Continued on p 114)

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Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y. Pp 618. Price $8.

The Sulphur Data Book. Prepared by the Technical Staff of Freeport Sulphur Co., and edited by William N. Tuller, Superintendent of Laboratories, Port Sulphur, La. Topics discussed include: The nature of sulphur; physical and chemical properties of sulphur; reaction thermodynamics; solubility of sulphur in various substances; and methods of sulphur analysis. Published by McGraw-Hill Book Co., 330 W. 42 St., New York 36, N.Y. Pp 143. Price $5.

The following reports may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., at the prices specified:

U. S. Geological Survey Bulletin 982-G. Geology of the Dover Magnetite District, Morris County, N. J. By Paul K. Sims. Pp 305, plus plates, figures and tables. Also U. S. Geological Survey Bulletin 982, Contributions to Economic Geology, 1952-53. Plates, figures and maps. Price not specified.

U. S. Geological Survey Bulletin 995-D. Geologic Investigation of the Boyertown Magnetite Deposits in Pennsylvania. By H. E. Hawkes, Helmuth Wedow and J. R. Balsley. With a section on land and airborne magnetic surveys in the vicinity of Boyertown, Berks County, Pa. Pp 8, plus plates, figures, maps. Price 50c.

U. S. Geological Survey Bulletin 995-F. Some Magnetite Deposits in New Jersey. By Preston E. Hotz. New data, based upon geologic studies, dip-needle surveys and diamond-drill-hole exploration. Pp 52, plus tables, figures, maps. Price $1.

U. S. Geological Survey Bulletin 995-H. Three Deposits of Strippable Lignite West of the Yellowstone River, Montana. By W. C. Culbertson. With estimates of reserves available. Pp 38, plus maps, tables, figures. Price 50c.

U. S. Geological Survey Bulletin 997, The Geology and Ore Deposits of the Reese River District, Lander County, Nevada. By Clyde P. Ross. A geologic study of one of the old bonanza silver camps, with a section on geological surveys by E. L. Stephenson. Pp 128, plus maps, plates, figures. Price $1.75.

U. S. Geological Survey Bulletin 998-C. Some Lead-Zinc Copper Deposits of the Ketchikan and Wales Districts, Alaska. By G. D. Rovinson and W. S. Twenhofel. A description of the deposits at Moth Bay Mahoney Creek and Dora Lake. Pp 82, plus maps, figures. Price 55c.

U. S. Geological Survey Bulletin 988-G, Geology of the Area Adjacent to the Free Enterprise Mine, Jefferson County, Montana. By W. A. Roberts and A. J. Gude III. The report concerns work done on behalf of the Atomic Energy Commission. Pp 10, map, figures. Price not specified.

U. S. Geological Survey Bulletin 1002-C. Geophysical Abstracts 154, July-September 1953. By Mary C. Rabbitt, S. T. Vesselowsky et al. Abstracts of current literature pertaining to the physics of the solid earth and geophysical exploration. Pp 52, plus index. Price 25c.

U. S. Geological Survey Bulletin 1002-D, Geophysical Abstracts, October-December 1953, Numbers 14805-15026. By Mary C. Rabbitt, S. T. Vesselowsky et al. Current literature abstracts pertaining to the physics of the solid earth and geophysical exploration. Pp 105, plus indexes. Price 25c.

U. S. Geological Survey Bulletin 1004. Geology and Ore Deposits of the Willow Creek Mining District, Alaska. By Richard G. Ray. A study of the general and economic geology of a lode gold mining district in southern Alaska, with emphasis on significance of vein, dike and fault patterns. Pp 81, plus maps, illustrations, tables. Price $1.75.

U. S. Geological Survey Bulletin 1006, Collected Papers on Methods of Analysis for Uranium and Thorium. By F. S. Grimaldi, Irving May, Mary H. Fletcher and Jane Titcomb. Done on behalf of the Atomic Energy Commission. Pp 184, plus maps, figures, tables, plates. Price $1.

U. S. Geological Survey Bulletin 1009-B. Identification and Occurrence of Uranium and Vanadium Minerals from the Colorado Plateaus. By A. D. Weeks and M. E. Thompson. A contribution to the geology of uranium for field geologists and others having few laboratory facilities. Pp 49, plus tables. Price 25c.

U. S. Geological Survey Bulletin 1022-A. Geophysical Abstracts 156, January-March 1954. By Mary C. Rabbitt, Dorothy B. Vitaliano, S. T. Vesselowsky and others. Abstracts of current literature. Pp 69. Price 25c.

LETTERS

(Continued from p 4)

by the Minister of Finance, who evidently recognizes (that) risk as he prohibits the insurance companies (holding) any mine securities. He mentioned further that mineral deposits are irreplaceable and a high export tax confines mining operations to the high grade ores, leaving vast tonnages of unprofitable ore untouched, which reserves will never be recovered. Without the export tax, these low grade ores would be a big source of revenue to the mining companies as well as to the Federal treasury, as (they are) in Peru, Canada and the U. S., where taxes are based on income

CHARLES WILL WRIGHT
Washington, D. C.

Michigan Jasper

(Continued from p 104)

about 0.65 lb per ton of crude ore. No water conditioning is necessary. An acid circuit was planned originally, but a neutral pulp has been found to work well.

In addition to the two banks of Steffensen No. 55 cells shown in the flowsheet, a bank of No. 24 Denvers has been added. These operate in parallel with the air cells. There are 6 roughers, 3 cleaners and 2 recleaners in each bank of air cells and in the Denver machine.

Pulp density in the Humboldt flotation is not too critical. Roughing is at 35% solids; cleaning and recleaning at 28 to 30%. Typical metallurgical results are shown in Table I. See page 104.

Good Spirit Shown

In the entire concentrating plant operation, aside from maintenance employees, only four men are needed per shift. Most of the mill is an automatic, push-button job, which explains only in part, however, Cleveland-Cliffs' success in training a green crew at start-up. As anyone familiar with milling knows, flotation is pretty much of an art. Flotation at Humboldt is a matter of intuition, as well, because it is almost impossible to tell from the appearance of the froth how the cells are doing. Low-grade and high-grade froths look very much alike.

Therefore, it is all the more remarkable that beginning with men who had never seen a flotation machine before, the management was able to train operators in two months' time who could be left to handle the mill competently without a metallurgist standing by. This is an achievement both operators and management are proud of, and one senses it the minute he walks into the mill. The operators are on their toes, and the results show it. Mill supervision consists of Richard Smith, plant metallurgist, and Everett Waisanen, mill foreman. John Nigra is master mechanic.

Grade of feed at Humboldt is about 34% Fe; grade of concentrate is about 61% to 63%. Ratio of concentration is about 2¼ : 1. By weight, recovery of iron from the mine-run ore is about 44%. Tailing runs about 8% Fe.

Like all mine operators, the Humboldt owners are understandably mum on operating costs. The plant location near the mine, the efficient methods used in mining and milling, do give Humboldt a comfortable margin on its present product, however.

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Overall view of mine, showing conveyor belt system.

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The very first Ustex®-nylon belt was installed by "U. S." in May, 1948, in a Minnesota iron mine. Originally, it was installed in two sections, to carry 700 tons per hour. After years on this job, carrying over 7,500,000 long tons, the belt was moved to another location to replace a belt of different make that had failed. On its new job the Ustex-nylon belt was spliced in one piece and installed on the job site by "U. S." service engineers. It now handles *not* 700 tons, but 1200 tons an hour on twice the center distance and a higher lift. Yet year after year the belt continues to do *twice the work it did originally!* The pleased mine officials placed an order for 1829 additional feet of "U. S." belting for further expansion.

This Ustex-nylon belt has Ustex for strength, nylon for flexibility, and is an example of the many pioneering developments of "U. S." in materials haulage. Cut costs to the bone by making use of U. S. Rubber's *Three-way Engineering*, in which "U. S." engineers work closely with the mine engineers and the conveyor system engineers. Get in touch with one of the 26 "U. S." District Sales Offices, each staffed with sales engineers, or see any of the "U. S." distributors or write the address below.

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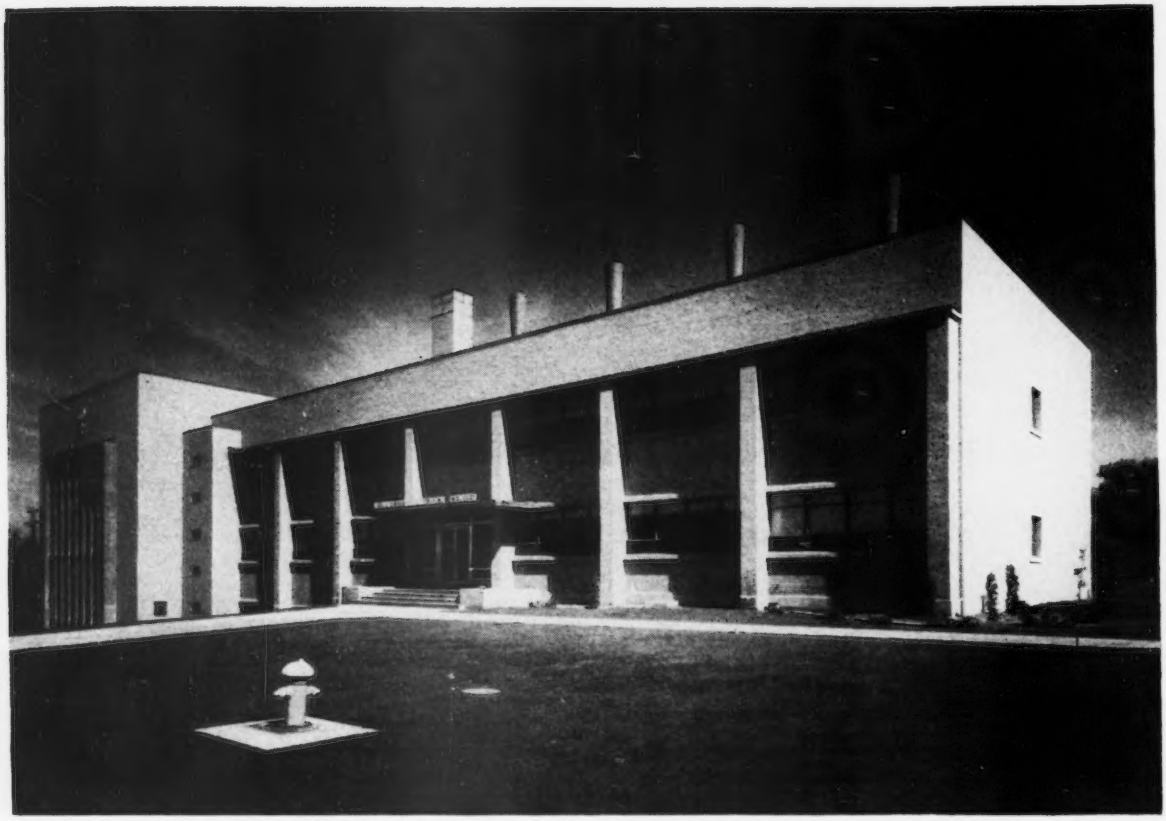

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Kennecott Copper's Research Center Formally Dedicated in Salt Lake City

KENNECOTT COPPER CORP.'s ultra-modern $1¼-million Research Center in Salt Lake City is being officially dedicated Aug. 13.

The Research Center will serve as a central facility, coordinating and handling expanded research programs for the Corporation's four Western Mining Divisions.

Overall operations of the 50-man staff will be headed by S. R. Zimmerley, former chief of the Metallurgical Branch, Region IV of the U. S. Bureau of Mines.

S. R. Zimmerley director

Located on the University of Utah campus, adjacent to that institution's School of Mines, the new Research Center likewise is within easy highway range of Kennecott's mammoth Bingham Canyon open pit mine, and the firm's milling and refining operations at Magna, Arthur and Garfield. In addition, the Salt Lake City campus site is well-located as regards to company operations in Arizona, Nevada and New Mexico.

Discussing the research program, E. S. Hann, Kennecott's treasurer, pointed out that "the laboratories, with up-to-the-minute research facilities, including pilot plants, comprise one of the most important and far-reaching projects undertaken by the company in recent years, and should prove an invaluable asset in our endeavors to recover additional metal from the ores mined."

Such research, he noted, "will not be confined to one activity," but will deal with the recovery and use of metals in addition to those now being produced.

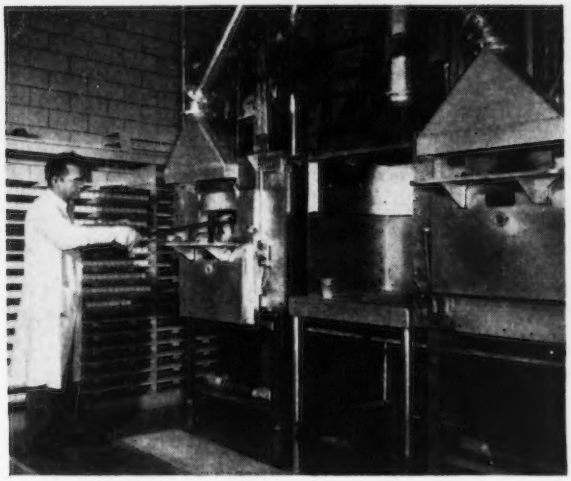
Three Stories High

The Research Center, a three-story structure of concrete, brick and steel, will afford 40,000 sq ft of space, with pilot plant facilities using some 12% of the area and laboratories and offices occupying the remainder. Tinted glass, fluorescent lighting, individual ventilation and temperature control are laboratory features, along with use of glazed ceramic tile walls, asphalt tile or cement floors and transite ceilings.

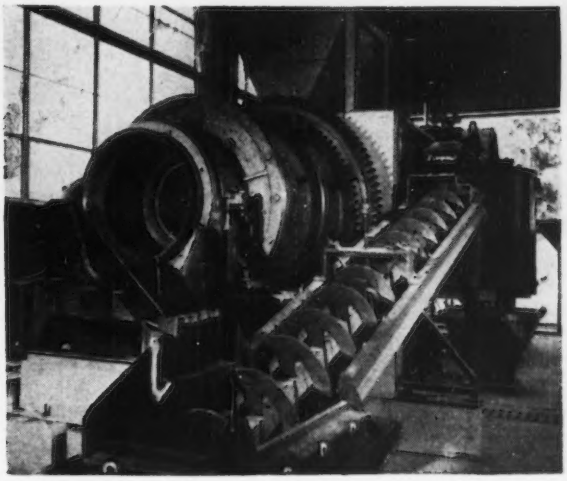
To prevent pilot plant vibrations from affecting laboratory work, the pilot plant portion of the structure is separated from laboratory quarters by an expansion joint extending through the entire building structure.

DR. ARTHUR W. LAST, head, Center's pilot plant examines bank of flotation cells, key step in output from low-grade ore.

DR. RALPH WOOD checks X-ray defraction with fluorescent attachment unit used to determine micro quantities of metals.



F. H. SNYDER, research laboratory technician, uses electric assay furnace, capable of maintaining 2070 deg F.



PILOT PLANT, designed to treat 600 lb of low-grade ore an hour, includes ¾-ton ball mill, ore classifier, thickener tank.

To meet Kennecott's problem of treating large quantities of low-grade ores, a pilot flotation mill was designed to handle 600 lb of ore per hour. A multiple hearth roaster and a FluoSolids roaster, capable of roasting one ton of pyrite concentrates per day, are being installed, while electric furnaces for smelting 25 to 500 lb per charge will round out the Research Center's pilot plant.

Research Laboratories are equipped to study all types of metallurgical problems and fundamental research. The ore dressing section and the units devoted to hydrometallurgical and pyrometallurgical investigations are termed the most modern and complete in the industry.

Installations in the laboratories include an X-ray diffraction unit with fluoroscopic attachment, a 3.4 meter emission spectrograph, and an infrared absorption spectrophotometer for physical analysis. In addition to such equipment destined for studying the structure and composition of ores and metallurgical products, complete chemical laboratory facilities are provided.

Projects Now Underway

Projects already underway at the Kennecott center deal with improved recovery of copper and other metals by leaching. Pilot plant testing of improved techniques in extractive metallurgy resulting from laboratory work will begin with the arrival of additional equipment.

In addition to studies of better recovery of ores from present waste materials of the Utah operations, studies are underway bearing on the flotation processes used in Kennecott's mills in the Southwest. New flotation reagents are under examination, as are studies of the feasibility of leaching unrecovered copper from present tailings, while scouring of oxide minerals from sulphide minerals to improve overall copper recovery is also being investigated.

Treasurer Hann underscored the value of research with this summation:

"We have entered the atomic age and a new era of speed, bringing jet propelled aircraft. Great advances have been made in medicine, surgery, bio-chemistry and new drugs. The world of electronics, with guided missiles, radar and electronic brains is moving ahead so fast, an ordinary individual is unable to comprehend the impact on society of these great accomplishments.

"Success of the scientists in our Research Center will help Kennecott keep abreast of advances in other fields and, thereby, continue its leadership as the world's largest producer of copper."

PERSONAL NEWS

Frank S. Wartman, head of titanium research of USBM, at Boulder City, Nev., succeeds **Rex R. Lloyd,** (right) station chief. Lloyd leaves to join Titanium Metals Co. of America, at Henderson. Mr. Wartman, a veteran of 30 years service, recently received the department's highest award for his part in the development of a commercial process for titanium.

George T. Harley, manager of International Minerals and Chemical Corp.'s potash mines at Carlsbad, N.M., retired July 1 under the regular retirement policy of the company. Mr. Harley had been manager of the mines for 10 years.

William C. Browning, Los Angeles mining consultant and member of the California State Board of Mining, has been awarded an honorary doctorate in engineering by the University of Utah.

John Beattie, manager of Delnite Mines, has been elected president of the Ontario Mining Association.

Roy W. Drier, Houghton, Mich., will undertake an expedition to Isle Royale, Lake Superior to continue his search for ancient copper workings of historic nature on the island.

William McOuat Cottingham, member of the Quebec legislature from d'Argenteuil, was sworn in as Quebec mines minister on June 2.

Dr. James D. Forrester, professor and chairman of the mining engineering department, Missouri School of Mines, has been named dean of the college of mines at the University of Idaho, succeeding **A. W. Fahrenwald,** who will retire Sept. 1. Dr. Forrester will also serve as director of the Idaho Bureau of Mines and Geology.

C. W. Massie, Sr., of Charlestown, W. Va., has been named to serve as mining engineer with the Virginia Department of Conservation and Development.

Mrs. M. K. Madsen was elected president of the Women's Association of the Mining Industry of Canada at the annual meeting in Toronto in June.

William B. Wallis, president of the Pittsburgh Lectromelt Furnace Corp., received the distinguished alumnus award from Pennsylvania State University.

Ryukiti R. Hasiguti was recently promoted to a full professorship in the department of metallurgy, University of Tokyo.

Earl C. Herkenhoff, Pickands, Mather & Co., Hibbing, Minn., has succeeded **Milton F. Williams,** Oliver Mining Div., Duluth, as chairman of the Minerals Beneficiation sub-section, AIME Minnesota Section. **John D. Boentje,** Pacific Isle Mining Co., became vice chairman and **Richard W. Livingston,** of J&L's Minnesota Ore division, secretary-treasurer.

Morris F. LaCroix, senior partner of Paine, Webber, Jackson & Curtis and president of Copper Range Co., was awarded an honorary degree of Doctor of Engineering at the commencement at the Michigan College of Mining & Technology.

John Q. St. Clair and **R. J. Crowley** have announced the opening of their offices for geological investigations, exploration drilling, evaluation and management on the Colorado Plateau.

H. R. Gault is returning to Lehigh University as professor of geology after a year's leave of absence as executive secretary, division of earth sciences, National Research Council.

Henry B. Fry, former manager of the New York operations office, AEC, has become assistant manager for administration and services in the Santa Fe office at Albuquerque. In other commission changes, **Dr. Merrill S. Eisenbud** has succeeded Mr. Fry and **Dr. Harold Fidler's** San Francisco area office was made an operations office.

John Kervin, Steep Rock Lake, Ont., was recently named general pit foreman for Steep Rock Iron Mines, replacing **W. H. Roxburgh,** who has resigned.

B. E. Schonthal, Chicago, will retire from the post of secretary-treasurer of the Illinois Mining Institute, a post which he has held for 25 years.

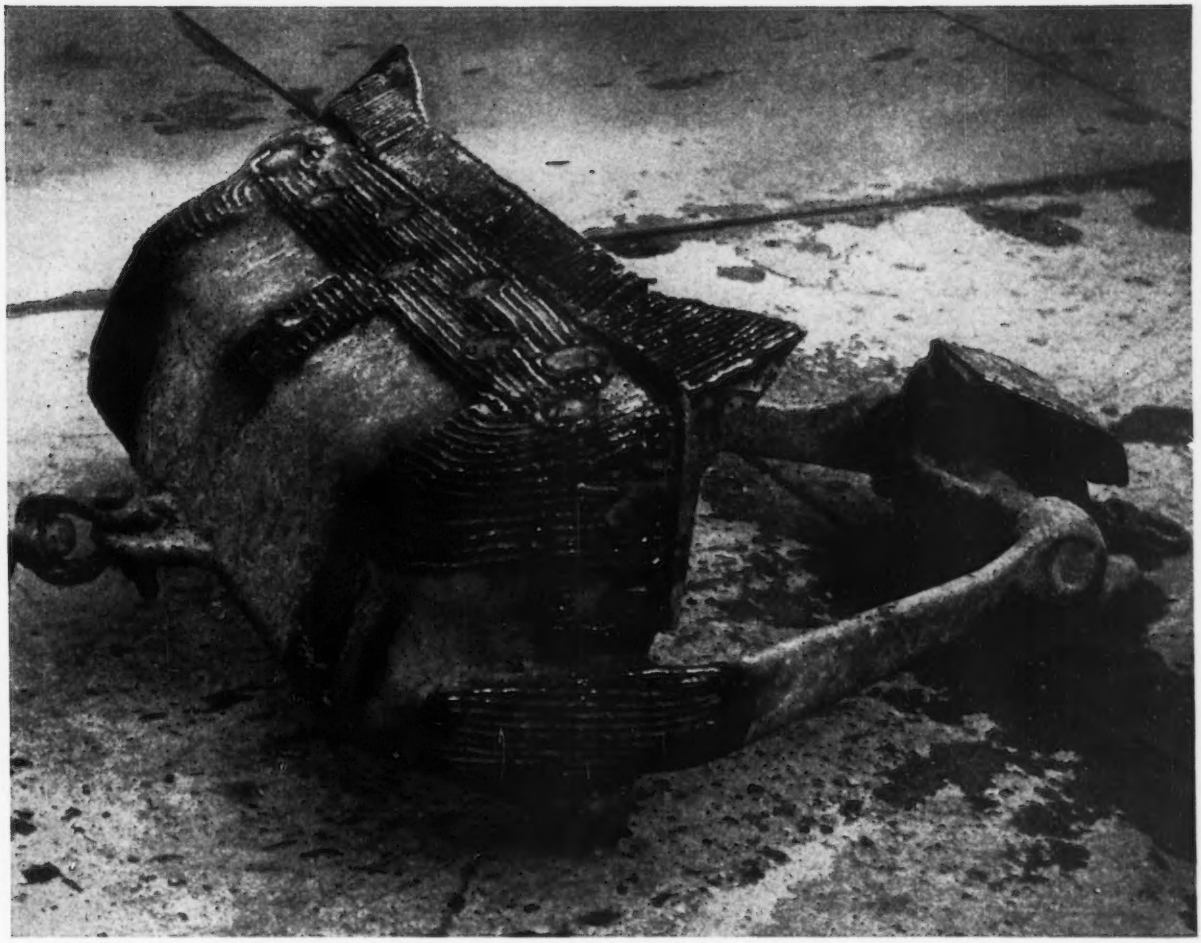
Arnold Sobering, mine manager of Stadacona Mines, has been appointed chief engineer for Geco Mines, at Manitouwadge. He is succeeded by **W. W. Bake,** former mine superintendent for Brunswick Mining and Smelting Corp.

James Young is now engineer at Pickands, Mather's Albany iron mine, on the Mesabi Range, succeeding **Del Carlton,** new assistant district engineer on the Cuyuna.

John C. Perry, veteran general manager of Lamaque Gold Mines, has been elected director and president of that company as well as of the Teck-Hughes Gold Mines, Lamaque's parent company.

Curtis L. Wilson, dean of the Missouri School of Mines, Rolla, was awarded an honorary degree of Doctor of Engineer-

The "big three" authorities in the field of strategic metals, members of the executive committee of the Tungsten Institute **K. C. Li,** (left) president of Black Rock Mining Co. and chairman of Wah Chang Corp.; **W. Lunsford Long,** (center) vice-president and general counsel of Tungsten Mining Corp. and president of the Institute; and **Charles H. Segerstrom, Jr.,** president, Nevada-Massachusetts Co. and vice president of the Institute; are shown at a meeting in Washington, D.C.



See the Stoody Working Display, Booths 2119-2123 at th e Mining CONGRESS SHOW, San Francisco, Sept. 20-23.

MUCK RAKE LIFE EXTENDED 6 TIMES by simple Hard-Facing procedure

A typical example of what hard-facing can do for many kinds of mining equipment.

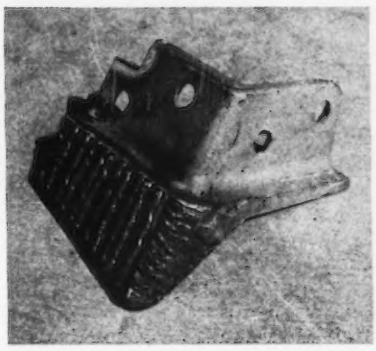
In surface and underground mines muck rakes take a severe beating from the highly abrasive ores handled. Most of the wear is taken by the end bits, although the lips, bottoms and clevis sides suffer too.

HOW HARD-FACING SAVES THE METAL

A typical application shows the use of Coated Tube Stoodite stringer beads—usually applied on the bottom at right angles to the direction of travel. This procedure allows earth to pack between the stringers and helps insulate the body against wear. On the lip, stringer beads are laid down close together in the direction of travel.

END BITS NEED SPECIAL TREATMENT

The corner of the end bit receiving the severest abrasion should be protected with Stoody Tube Borium, a tungsten carbide alloy that gives maximum resistance to wear. The remaining portion of the end bit gets stringers of Coated Tube Stoodite. This pattern and the use of two different metals balances overall life of the equipment, provides greatest wear resistance where it is most needed and provides adequate protection at other wear points where a less costly alloy does the job.



Muck rakes hard-faced as illustrated with Stoody metals will, in general, give 6 to 8 times the service of standard equipment.

SEE YOUR STOODY HARD-FACING GUIDEBOOK

This and other hard-facing procedures are fully described in the mining section of the Stoody Hard-Facing Guidebook. Ask your Stoody Dealer for a copy (see the yellow pages of your phone book) or write direct.

STOODY COMPANY

Prof. George B. Clark of the University of Illinois has been appointed professor of mining engineering and chairman of the department of mining engineering at the University of Missouri School of Mines and Metallurgy, Rolla.

ing at Washington University, St. Louis, Mo.

William H. Eisenman, national secretary for the American Society for Metals, has been nominated to succeed himself for the 19th consecutive two-year term.

At a recent stockholders' meeting of St John d'el Rey Mining Co., in London, the Rt. Hon. **Lord Rathcavan** announced the appointment of **H. I. Altshuler** as consulting engineer. Mr. Altshuler is now at the company's mines in Brazil and will also visit the mines of New York & Honduras Rosario Mining Co.

Blanford C. Burgess, mining consultant, is now located at MSA-STEM, APO 928, care of Postmaster, San Francisco, Calif.

L. K. Walkom, for the past nine years district inspector of mines in the Kirkland Lake area for the Ontario Department of Mines, has been appointed editor of the Canadian Mining Journal, succeeding **H. R. Rice.**

Odin A. Sundness, Duluth, vice president of the Synder Mining Co., was named by **Governor C. E. Anderson** as a technical representative of Minnesota to the International Peat Symposium, in Dublin.

E. A. Friedman, general superintendent in the Canisteo District for Oliver Iron, has announced the appointment of **Frank J. Hitchcock** as operating budget engineer for the area.

Floyd W. Erickson has been named general superintendent of Reserve Mining Co.'s taconite concentration plant at Babbitt.

Russell F. Kohn, superintendent of the Embarass mine of Pickands, Mather, is now superintendent at Erie mine, Babbitt.

James P. Pollock has succeeded **Dr. Thomas M. Broderick** as chief geologist for Calumet & Hecla, Inc. Dr. Broderick retired June 1 after 34 years service.

J. S. Roper has been appointed manager of the Howe Sound Co. Chelan division, at Holden, Wash. He is succeeded as mine superintendent at Howe Sound Exploration Company, Ltd., Snow Lake, Manitoba, by **George Durham,** former mine engineer. **K. J. Kutz,** former mine engineer at Britannia Mining & Smelting Co. Ltd., has been made chief engineer at Howe Sound Exploration.

Hanna Nickel Smelting Co's new Oregon plant, scheduled for production of ferronickel beginning this summer at Riddle, Ore. near the nation's only direct source of nickel bearing ore, will obtain federal energy under contract signed May 19 in Portland, by company officials and Bonneville Power Administrator **William A. Pearl.** Pictured at the signing are: seated, left to right, **Earl S. Mollard,** general manager, Riddle plant and Hanna's western operations manager, and Dr. Pearl. Observing are, left to right, **A. S. Cummins,** president of The California Oregon Power Co, and **H. L. Pierce,** president of Hanna Nickel Smelting.

Emory M. Heuston, associated with the advertising department of Bucyrus-Erie for the past 25 years, has joined the Richard T. Brandt, Inc., advertising agency, of Cleveland.

George A. Komadina has been appointed chief metallurgist for Eagle-Picher Co., mining and smelting division, Miami, Okla.

Robert M. Reininger, executive vice president of New York and Honduras Rosario Mining Co., has been elected president and a director of the company. Mr. Reininger, who has been associated with the Central American operations of the company as well as in their executive offices in New York for the past 15 years, succeeds the late **William A. Prendergast.**

New officers of Climax Molybdenum Co. of Colorado include: **Weston G. Thomas,** executive vice president; **Frank Coolbaugh,** vice president, western operators; **Alvin J. Herzig,** research vice president; **Wallace MacGregor,** treasurer; **George P. Fillius,** assistant treasurer.

Rex F. Pearce, formerly of South African Cyanamid, Johannesburg, South Africa, is now with Sherritt Gordon at Fort Saskatchewan, Alberta.

Dr. Kenneth L. Cook, associate professor and head of the department of Geophysics, University of Utah, has been appointed to the executive committee of the Mining, Geology and Geophysics division of the AIME.

H. H. Merritt, former chairman and general manager of the Geita Gold Mining Company Ltd., Geita, Tanganyika, has joined Williamson Diamonds Ltd. as assistant to **Dr. J .T. Williamson,** managing director and general manager.

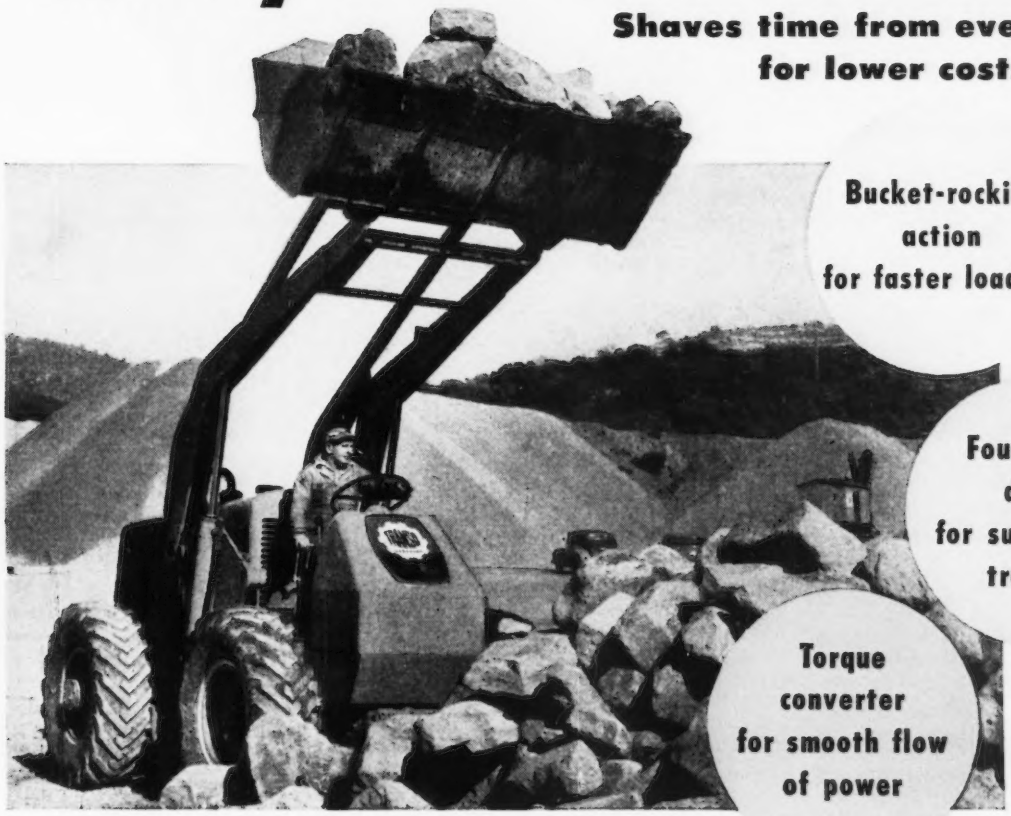
R. V. Porritt, general manager of Noranda Mines, has been elected a director of Upper Canada Mines, Ltd., succeeding the late **Oliver Hall.**

Dr. Robert T. Petersen, nuclear physicist, has joined Republic Steel Corp. He was formerly chief of the Industrial and Production Reactors branch, division of Reactor Development, AEC.

W. R. Elliot, Pittsburgh, vice president of industrial relations for Jones & Laughlin Steel Corp., has retired on the advice of his physician. Mr. Elliott is succeeded by **V. H. Lawrence,** former vice president-planning and control. In another company

Always on the Double!

Shaves time from every cycle, for lower costs



Bucket-rocking action for faster loading

Four-wheel drive for sure-footed traction

Torque converter for smooth flow of power

LE ROI-TRANSO TLF-150 Front-end Loader

YES, sir, a 1½-yard Le Roi-Transo TLF-150 lets you move more load — faster — at lower cost — without tire spin or undue engine strain — in sand, mud, snow, or rocky terrain. It's engineered that way.

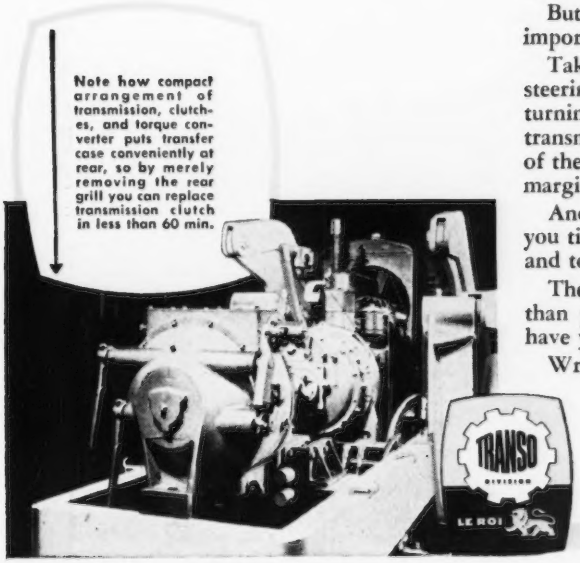
But that's only part of the Le Roi-Transo story. There are other important advantages.

Take maneuverability, for example. The TLF-150 has power steering, short (84") wheelbase, short over-all length, and a small turning radius — so it's easy to handle. Planetary-type, reversing transmission cuts reversing time 85%. The low carrying position of the bucket gives you especially good vision and provides an extra margin of safety.

And when it comes to maintenance, the TLF-150 is built to save you time and money. Engine, transmission, clutches, axle assembly, and torque converter are grouped compactly and are easy to get at.

There are even more reasons why a Le Roi-Transo TLF-150 more than pays its way on material-handling jobs. See for yourself — have your Le Roi-Transo distributor arrange a demonstration.

Write for latest bulletin.


Note how compact arrangement of transmission, clutches, and torque converter puts transfer case conveniently at rear, so by merely removing the rear grill you can replace transmission clutch in less than 60 min.
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MILWAUKEE 14, WISCONSIN TD-10
Plants: Milwaukee • Cleveland—Greenwich—Dunkirk, Ohio • Coldwater, Mich.

On a recent trip to New York, **Charles A. Steen,** of Moab, Utah, visited the offices of *E&MJ*. Mr. Steen spent some time with the editors, discussing current developments in the uranium field and particularly the Colorado Plateau. Shown above (l to r) are **Al Knoerr,** managing editor, Mr. Steen, **George Lutjen,** associate editor, and **Jack Kearney,** news editor. Steen credits a part of his success on the Plateau to an article he read in *E&MJ*.

change, **J. E. Graf,** chief engineer, was made a member of the management committee.

Wilson D. Mitchell, geologist for Reynolds Metals Co., has been transferred to take charge of the geological division's exploration program in the Guianas and will make his headquarters in Paramaribo, Surinam. **Bruce A. Randall,** another geologist with Reynolds Metals, has been transferred to Salida, Colo. Both announcements were made by **J. H. Moses,** chief geologist.

Stanley McDougall, Kellogg, Ida., mine superintendent for Bunker Hill & Sullivan in the Coeur d'Alenes, has been made manager of mines.

John E. Kelly, Washington, D.C., spent two weeks in Venezuela recently studying that nation's planned billion-dollar public works program.

E. C. Bitzer, of Golden, Colo., has resigned as metallurgical adviser to the division of raw materials, AEC, and returned to private consulting practice in Golden.

Wallace D. Barlow, formerly of USBM, has been made head of the resources unit of the Office of Naval Material, Navy Department.

J. E. Auchmody has been promoted from assistant to the president to the post of comptroller, Simplex Wire & Cable Co.

H. Dodge Freeman was elected vice president of White Pine Copper Co., a subsidiary of Copper Range Co. at the meeting of the board of directors, as was **Donald E. Moulds,** general manager of the mining division of Copper Range. **William P. Nicholls** was elected to the office of secretary.

Dr. John F. Thompson, chairman of International Nickel Company, Inc., has accepted the chairmanship of the nonferrous metals division in this year's National Safety Council campaign.

H. T. Heard has been made general superintendent of Eugenia Gold Mines, Lima, Peru. He was formerly with Cia. Minera San Juan de Lucanas, Nazca.

W. L. Zeigler, general manager of Pend Oreille Mines and Metals Co., Metaline Falls, Wash., has been awarded an honorary degree of Doctor of Science by the University of Idaho.

William F. Ryan, Boston, vice president and senior consulting engineer of Stone & Webster Engineering Corp., was awarded an honorary degree of D.Sc. by the Catholic University of America.

Robert S. Moehlman, vice president, was elected executive vice president of Austral Oil Exploration Co., Houston. **James H. McGuirt,** chief geologist, was made a vice president, as was **C. Wardell Leisk,** general superintendent.

OBITUARIES

Stephen Royce, 65, Crystal Falls, Mich., chief geologist for Pickands, Mather & Co., died June 12, at Weston, Mass., where he and Mrs. Royce were visiting.

W. John McDonough, 55, aircraft and mining leader of Canada, died suddenly on a trip to New York City.

John A. Savage, 70, Minnesota mining range executive, died June 14 while en route to a Duluth hospital. Mr. Savage was president of an independent mining firm.

Stanley Walker, 66, Bureau of Mines employee since 1940, died of a heart attack June 18 while on assignment in India. His ashes were returned to Denver after cremation in the Kingdom of Nepal.

Jaques van Tijn, 61, mining engineer and president of Mining Equipment Corp., died March 13.

Orville R. Lyons, preparation manager, Republic Steel Corp., of Cleveland, died Feb. 2, 1954.

W. M. H. Woodward, retired mining engineer with the U.S. Forest Service, died Nov. 20, 1953 in Denver.

Paul R. Moyer, 50, chief, rock machinery branch, NPA, passed away Dec. 19, 1953.

N. J. Everard, former manager of the Keeley mine in Cobalt and the Vipond mine in Porcupine, died in Victoria, B.C. He was 86.

Joseph B. Cox, 83, vice president and one of the founders of Sunshine Mining Co., died recently in Spokane, Wash.

Walter J. Nicholls, 78, president of Gladstone Mining Co. and dean of Spokane mining brokers, died suddenly in that city on June 20.

James M. Hocking, 91, died June 25 in Virginia, Minn. He worked in the first iron mine in Minnesota in Soudan, on the Vermillion Range, and later was mine captain at Eveleth.

Kenneth B. Frazer, 65, assistant secretary-treasurer of Anaconda Mining Co., died in Butte, Mont., on June 16.

William L. Murphy, 77, Montana attorney for Anaconda Copper Mining Co., died on June 20.

Alfred H. Gaze, 68, general manager of the British Phosphate Commission since 1920, died in Melbourne on March 25.

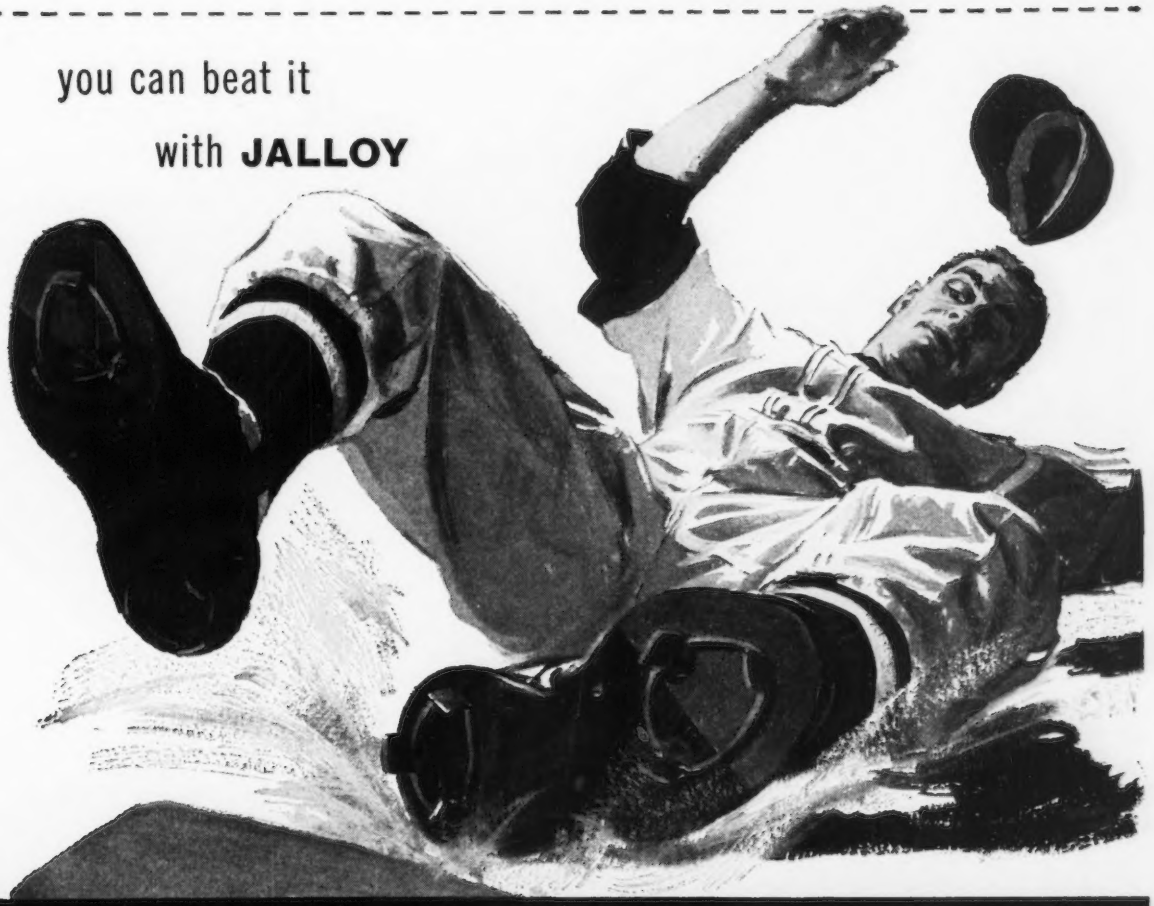
C. H. Smith, 61, former mining engineer and chemist, died June 22 at his home in El Cerrito, Calif. He was chief chemist for Nevada Douglass Consolidated Copper Co. in Ludwig, Nev. before going to China and Burma in 1919.

Fernando C. Fuchs, 83, mining engineer and former Minister of State in Peru, died in Lima on Feb. 21.

FACING A TOUGH PROPOSITION?

you can beat it

with **JALLOY**



J&L JALLOY HEAT-TREATED PLATE BEATS WEAR DUE TO ABRASION

J&L Jalloy Heat-Treated Plate is the special purpose steel that is heat treated to provide longer wear on applications where impact and abrasive conditions are severe.

In comparison with other abrasion-resistant steels as well as mild steels, it gives optimum results when heat treated to a Brinell hardness of 340 and up. Jalloy permits savings in steel costs, maintenance, and repair. Furthermore, it is easily welded. Jalloy is available in three grades to meet various service requirements.

J&L STEEL

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STEEL CORPORATION — *Pittsburgh*

Complete data concerning CHEMICAL COMPOSITION . . . HEAT TREATMENT . . . WELDABILITY . . . PHYSICAL PROPERTIES . . . will be mailed to you promptly. Write today.

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☐ Please mail complete data concerning Jalloy.
☐ Please have your representative call.

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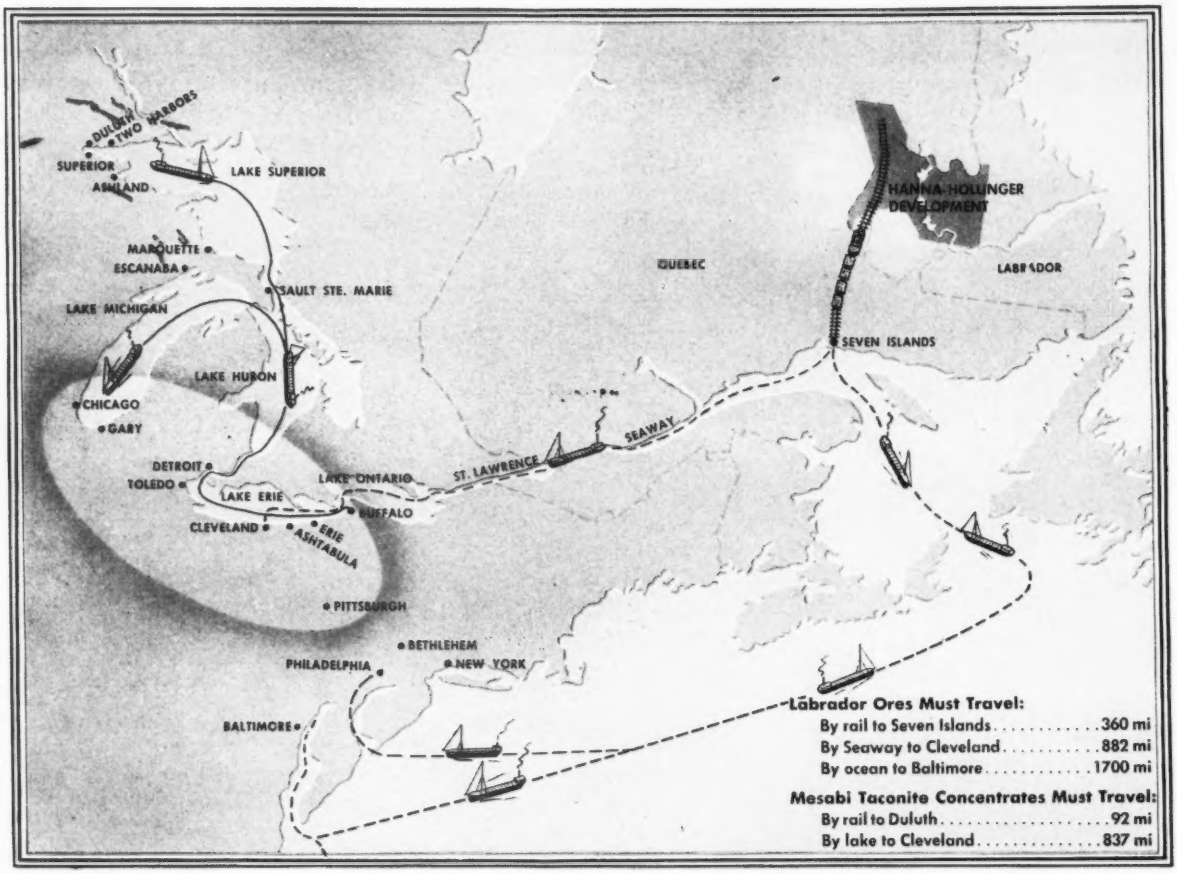
THIS MONTH IN MINING



NEAREST IN MILES to furnaces of the Great Lakes steel-making area of all the major iron resources outside the United States are the Labrador-Quebec deposits, heir-apparent to the iron throne held by the Mesabi for the past half-century.

Historic First Shipment of Labrador Iron Ore Opens Supply Line to 500-Million Ton Deposit

ON JULY 31ST, amid much ceremony, the first commercial shipment of iron ore from Iron Ore Company of Canada holdings in Labrador-Quebec left the port of Seven Islands, Que. Thus was ushered in a new chapter in the history of iron mining in the Western Hemisphere.

Laden with 19,000 tons of ore, a converted C-4 freighter, the Hawaiian, pointed her prow southward and headed for Philadelphia, 1365 mi away. Back of this first shipment was an investment of 12 years and $250-million.

IOC holdings, developed by Hanna-Hollinger Ltd., harbor an estimated 500-million tons of ore with 55%-65% iron content. It is expected that this mammoth storehouse, just 850 mi below the Arctic Circle, will increasingly shoulder much of the load heretofore carried by the thinning Mesabi.

One of the boldest industrial adventures of our time, the development of these holdings represents a combined assault of Canadian and United States vision, courage and capital. Comprising the Iron Ore Company of Canada are these nine companies:

From the U. S.—National Steel Corp., Republic Steel Corp., Youngstown Sheet & Tube Co., Armco Steel Corp., Wheeling Steel Corp. and Hanna Coal & Ore Corp.

From Canada — Hollinger Consolidated Gold Mines Ltd., Labrador Mining & Exploration Co. Ltd. and Hollinger North Shore Exploration Co.

In the remainder of the shipping season, IOC plans to ship 1- to 1.5-million tons. Shipping rate next year will be 10-million tons.

It is expected that this rate will be stepped up to 20-million tons after completion of the Saint Lawrence Seaway.

Moving this much ore to market will demand careful planning by C. E. McManus, IOC's manager of mines. Freezing of ore in cars limits rail transportation to a season of only 5½ months. Enough ore must be mined and hauled during that period to keep shiploading facilities busy at Seven Islands during the nine months that the port is free of ice.

Ruth Lake No. 3 was the first deposit opened and all 1954 mining will be done there. This pit will be about ½-mi long, 800 ft wide and will be worked to an eventual depth of about 350 ft. Plans call for 60-ft banks with 20-ft berms. In general Mesabi techniques will be followed.

Shipment of 10-million tons a year will mean seven trains a day of about 11,000 tons payload each throughout a

Jules Timmins
his faith . . .

George Humphrey
his encouragement . . .

Joseph Thompson
his executive follow-up . . .

William Durrell
his construction know-how . . .

. . . Combined to Bring the Labrador Iron Project to Production

prospective rail shipping season of 150-160 days a year.

Each train will consist of 115-117 specially-designed 95-ton cars, pulled by a four-unit diesel locomotive. Loaded trains will make the trip in 14 hrs; empty trains in 12. Maximum adverse grade against load over the 362-mi stretch does not exceed 4%. Building of the railroad itself was a monumental achievement (*E&MJ*, August 1953, p 78).

Operating rolling stock consists of 49 diesel locomotives, 20 cabooses and 2000 ore cars. Maintenance and construction rolling stock includes 175 ballast cars, 50 boarding cars, 20 pneumatic dump cars, 100 flatcars, 15 tank units, 20 boxcars and two 250-ton wrecking cranes (*E&MJ*, November 1953, p 188).

At Seven Islands, marshalling facilities cover 550 acres and include more than 40 mi of track. At dockside, two gantry-type loaders have a combined capacity of 8000 tph. A large ore boat can be loaded in about 5 hrs. The 1600-ft pier provides ample space for three ocean-going ore boats to ride anchor at the same time. Overall facilities at Seven Islands are designed to handle 70,000 tons of ore daily.

J. P. Smallwood, in the current issue of *Compressed Air*, gives this description of the geology of the region:

"The surface rocks are ancient gneisses of the Pre-Cambrian era. In the course of time, while the region was submerged and covered by an arm of the sea that ran in a northwesterly direction and was about 500 mi long and 100 mi wide, 2000 ft of sediment was laid down. One of the beds, about 400 ft thick, has an overall iron content of 30-40% and is known as the 'iron formation'.

"Either before or after the land emerged from the sea the rocks were compressed by shrinkage of the earth's crust, with the main force bearing from the northeast, into a series of faults and folds. Further shattering promoted leaching, and increased the iron-ore concentration to 55-65%. The ores are oxides of iron of varying colors with brown predominating, and approximately 12% or 53-million tons are magnetiferous."

At first, only a handful of men realized the economic importance of the deposit. Remoteness of the deposit was the main deterrent to investment.

One of the visionary few who sparked the huge development was Jules R. Timmins, president of Hollinger Consolidated Gold Mines and also president of Hanna-Hollinger Ltd.

Timmins approached Secretary of the Treasury George M. Humphrey, then president of M. A. Hanna Co. Timmins convinced Humphrey who, in turn, helped attract United States capital.

While Timmins and Humphrey pioneered this bold industrial dream, there are other men who may take justifiable pride in their contributions toward making it a reality. Among such men are:

Joseph H. Thompson, who succeeded Humphrey as president of M. A. Hanna. The Hanna company was in charge of the whole project and Thompson took a very active part in bringing it to fruition.

William H. Durrell, IOC general manager, whose wide construction experience in rugged northland (including the building of the airport at Goose Bay, Labrador) helped overcome the staggering problems associated with the building of the railroad and minesite.

In size, the Canadian ore deposits compare favorably with the Mesabi. The Mesabi is 110 mi long and 1-5 mi wide while the Labrador Trough is 225 mi long and 10-60 mi wide. In addition, the Mesabi's 70 mi productive zone is shaded by IOC's 90-mi stretch of high grade.

The 50-year-old Mesabi is by no means through. Estimates give it at least 20 more years of high-grade production. Also, operations are underway which economically upgrade low-grade taconite and jasper (see p 100, this issue).

But while the Mesabi has reigned as king for the past half-century, it may be stated that the Canadian crown prince is definitely coming of age.

Another major Western Hemisphere iron property which began commercial shipment this year is the Orinoco Mining Co. Cerro Bolivar operation in Venezuela (*E&MJ*, December 1953, p 92).

AT THE MINE, Ruth Lake No. 3, Bucyrus-Erie power shovel loads direct shipping ore into Euclid. Note waiting Euc.

AT THE DOCK, Seven Islands' installations include (1) stockpile area; (2) car dumping building; (3) ore mixing bins.

$25-Million Lavender Pit Begins Copper Production

PHELPS DODGE CORP.'S $25-million Lavender Pit copper project in Arizona officially entered production early this month.

Official ceremonies Aug. 7 set in motion regular operations at the mammoth mine near Bizbee, only a few miles from the Mexican border. By the end of this month, Phelps Dodge expects to have the mine, ore crushing and concentrating plants producing copper at a rate of 30,000 tons a year. Additional facilities for leaching lower-grade ore are to begin operation later this year and will boost copper production another 8000 tons a year.

In the past four years, more than 45-million tons of overburden have been stripped. At least 25-million tons of overburden remain. The pit itself is more than two-thirds of a mile long and is about half a mile wide. Its production life has been estimated at about 12 years. It will be worked to a depth of about 900 ft.

The porphyry orebody is estimated to contain 41-million tons of concentrating ore with an average grade of 1.14% copper and 31-million tons of material to be leached with an average grade of .42%.

Concentrator has a rated-capacity of 12,000 tons of ore a day and is located at the edge of the pit. The concentrating ore is moved from the pit in 25-ton trucks to primary crushers. Crushed ore moves by belt conveyors to the concentrator. Ore concentrates are moved 26 mi by rail to Phelps Dodge's smelter at Douglas, Ariz. After smelting, the raw copper is sent to the company's electrolytic refinery at El Paso.

Phelps Dodge bore the entire $25-million cost to bring the mine into production. Under a Government contract, the company may call on the Government to purchase up to 225-million lb of the first 300-million lb of copper produced at 22c a lb. The sales contract includes an escalator clause. The Government has the right to buy any part of the 300-million lb at the floor price or at the market price, whichever is higher.

The new copper giant was named after the late Harrison M. Lavender. As general manager of Phelps Dodge mining operations in the West, Mr. Lavender originated and was in general charge of the project until his death in March 1952.

Task of pressing the project to fruition fell to Charles R. Kuzell, who succeeded Mr. Lavender. In addition, others who contributed to the development of the project include: H. V. Kruse, chief engineer of the mechanical department at Douglas; C. E. Mills, manager of the Copper Queen Branch, which includes the Lavender Pit; Warren Smith, project pit superintendent, and R. C. Thompson, mill superintendent.

Lavender Pit is the largest of three major open pit copper projects to come into production since World War II.

Anaconda Copper Mining Co.'s Yerrington project began operating last November. It has a rated-capacity of 33,000 tons annually (see p 72, this issue).

American Smelting & Refining Co's Silver Bell project, which began operations May 1, has an annual capacity of 18,000 tons (see *E&MJ*, July 1954, p. 72).

Rum Jungle Uranium Plant September Opening Slated

AUSTRALIA'S RUM JUNGLE uranium plant will begin treatment of uranium ore Sept. 17—several months ahead of schedule.

H. Beale, Minister for Supply, said that output would be about double that originally planned. It will be the first full-scale plant for treatment of uranium ore in Australia. The plant was built by Consolidated Zinc Pty.

New Experiment Station

BUREAU OF MINES has invited all interested persons to be present at Reno on Sept. 25 at official dedication ceremonies of a new Rare & Precious Metals Experiment Station. Following the dedication, visitors will have an opportunity to inspect the new laboratory and pilot-plant facilities.

Kitimat's First Ingot

FIRST INGOT was poured Aug. 3 at Aluminum Company of Canada's giant smelter at Kitimat, British Columbia (see *E&MJ*, April 1954, p 78).

Mining Calendar

American Mining Congress Metal & Nonmetallic Mining Convention & Exposition, Sept. 20-24, Civic Auditorium, San Francisco.

AIME Minerals Beneficiation Division, Fall Meeting, Sept. 24, Fairmont Hotel, San Francisco.

AIME Industrial Minerals Division, Fall Meeting, Oct. 5-9, Whiteface Inn, Lake Placid, N. Y.

New Mexico Mining Association and Southwestern International Mining Association, Annual Meeting, Oct. 14-16, Carlsbad, N. M.

Rocky Mountain Region Industrial Minerals Conference, Oct. 28-30, Newhouse Hotel, Salt Lake City.

Society of Exploration Geophysicists, 8th Annual Midwestern Meeting, Nov. 18-19, Adolphus Hotel, Dallas.

Colorado Mining Association, Annual Meeting, Feb. 3-5, Denver.

American Mining Congress San Francisco Sept. 20-24

ADVANCE REGISTRATION

Each person requesting advance registration will be furnished a combination registration card and hand-lettered name plate. This will be mailed late in August. When presented at San Francisco's Civic Auditorium, the name plate will be detached and returned to the registrant with a badge holder, while the card will be retained for the official registration record. There is no registration fee except for representatives of non-exhibiting manufacturers.

HOTEL ACCOMMODATIONS

All requests for reservations should be sent to the AMC Housing Bureau, Room 300, 61 Grove Street, San Francisco, 2. All applications must be accompanied by a deposit of $10 for each room requested.

ADVANCE PROGRAM

(All events, except where otherwise indicated, will be held in the Civic Auditorium)

September 20

10 a.m. Opening session
2 p.m. Labor and Personnel Problems; Public Relations, Polk Hall
2 p.m. Geology and Exploration, 2nd-floor meeting room
2 p.m. Round Table Conferences

September 21

10 a.m. Public Lands Panel, Polk Hall
10 a.m. Nonmetallic Minerals, meeting room 301-2-3
10 a.m. Drilling and Blasting, 2nd-Floor meeting room
2 p.m. Stockpiling; Tariff, Government Mineral Programs, Polk Hall.
2 p.m. Uranium Exploration and Development—Colorado Plateau, meeting room 301-2-3
2 p.m. Underground Mining Methods, 2nd-Floor meeting room

September 22

10 a.m. Taxation; Gold, Silver and Monetary Policy, Polk Hall
10 a.m. Mining and Metallurgy of Uranium, meeting room 301-2-3
10 a.m. Underground Mining Methods, 2nd-floor meeting room
2 p.m. Uranium Industry and AEC Program on the Colorado Plateau, Polk Hall
2 p.m. Milling and Metallurgy, meeting room 301-2-3

September 23

10 a.m. Outlook for the Mineral Industries, Polk Hall
10 a.m. Open-Pit Mining, meeting room 301-2-3
2 p.m. New Developments in Uranium—North America, Polk Hall
2 p.m. Milling and Metallurgy, 2nd-floor meeting room
2 p.m. Open-Pit Mining, meeting room 301-2-3

September 24

10 a.m. Tax Forum, Mark Hopkins Hotel
10 a.m. Minerals Beneficiation Division, Fairmont Hotel

Many Major Mining Firms Join Uranium Rush
Colorado Plateau Is Center of Exploration

MORE U.S. MINING COMPANIES are entering the uranium derby each month as exploration goes farther afield and the Colorado Plateau continues to grow in potential and actual production.

Speaking of the present increased activity, Blair Burwell, Minerals Exploration Co., of Grand Junction, Colo., observes that the current boom on the Plateau will keep the U.S. in the lead of the nuclear and atomic world by assuring a continuous source of raw material. Burwell pioneered extraction of domestic supplies of uranium for the Manhattan and Oak Ridge projects. The human factor is the only limitation on production within this country of "all the uranium we will ever need," Burwell says.

He estimates that more than 2-million Americans will be engaged in the Colorado Plateau if the U.S. is to match Russia's concentration of machinery and slave laborers at the Czechoslovakian uranium mines.

Delta County, Colo. residents provide an indication of the increased action in uranium. More than 500 claims have been filed in the county clerk's office there since February, with May setting the peak at 263.

Some of the many companies entering the field in recent months, and which indicate the growing activity, are the following:

Calumet & Hecla Inc., Chicago, who signed an agreement with Canoncito Uranium Corp., Albuquerque, to prospect and develop 16,000 acres on the Canoncito Navajo Reservation, near Albuquerque. C&H will initiate a $300,000 core-drilling and prospecting program. Royalties will be paid to the tribe and the corporation when production begins. The 15x3-mi area, held by Canoncito, is directly east of Anaconda's holding.

Anaconda Copper Mining Co's large holdings on the Laguna Indian Reservation. Anaconda sent geologists into the area in 1951, after announcement of the discovery was made by the Santa Fe railroad. The copper company built a buying depot at Grants, N.M. at the request of AEC and is treating ore from 30 other producers at its plant. Jackpile mine, located on the reservation, has been opened and ore is being stockpiled pending modification in the plant flowsheet. (See "New Mexico Uranium", this issue of *E&MJ*, p 96).

Penn-Texas Corp., formerly Pennsylvania Coal and Coke Corp., has entered the Utah scene with acquisition of 100 claims in the Big Indian district, San Juan County and purchase of all outstanding stock of A&B Mining Co. A&B holds uranium rights on 2000 acres of fee-lands on the Navajo reservation and near Flagstaff. It has been shipping 50 tons of uranium per day to Anaconda's mill at Grants. Penn-Texas announced plans to double the ore shipments.

Rare Metals Corp. of America, Salt Lake City, has been formed by El Paso Natural Gas Co. and its affiliate, Western Natural Gas Co. Paul Kyser, president of the two gas companies, also heads Rare Metals, and Mitchell H. Kline, former head of USBM rare metals branch, is assistant manager. Kline announced that the new firm has "substantial" school section leases in the Moab area and will develop its own claims and cooperate in leasing and development for other companies.

Vulcan Uranium Co. is the new corporate name of Osborn Silver-Lead Co., of Wallace, Idaho, which has taken over exploration of two prospects with a total of 10 claims in the San Rafael Swell area of Grand County, Utah. H. J. Rossi, president, said the claims are near the producing Pick mine, and are held under option by William H. Sweet, of Green River.

New Jersey Zinc Co. announced that it has applied for leases on the Plateau in addition to its agreement with four uranium firms in the Blind River District of Ontario.

Lehigh Valley Coal Corp. has established an ore mining division for development of uranium and thorium properties and is negotiating for properties on the Plateau, in Wyoming, Florida and Canada (*E&MJ*, July 1954, p 178).

Lookout Mining and Milling Co., Kellogg, Idaho, has acquired a 34-claim tract with surface deposits of uraninite ore in the southwestern corner of Wyoming.

Inspiration Lead Co. Inc., Spokane, Wash., now owns a group of eight claims 4 mi south of the Utex mine in San Juan County. Company officials say that bulldozing and open pit work shows ore assaying 0.2 to 0.3% U_3O_8 and 2 to 3% vanadium.

National Uranium Corp., Wallace, Idaho, has leased and initiated drilling on a 10-claim property in the Coyote Wash area, San Juan County.

Vanadium Corp. of America will increase "moderately" its shipments of uranium to the nation's stockpile as a result of an amendment to its contract with AEC which now permits the company to install concentration equipment at Monument Mine No. 2, in northeast Arizona. To provide facilities for processing the vanadium-uranium ore, which had not previously been considered mill-grade, AEC also approved addition of a roaster at the firm's Durango, Colo., plant.

National Lead Co. will operate the AEC's Raw Materials Development Laboratory at Winchester, Mass., taking over from American Cyanamid Co., which has worked under commission contract since 1951. The laboratory works on development of processes for uranium-bearing ore treatment.

Climax Uranium Co., operators of one of the early mills on the Plateau, is continuing active exploration on the area, centering on a core-drilling program.

News Highlights

A potential copper development exists in the White Mesa area of the Navajo Reservation in Arizona. **Page 128.**

Shattuck Denn Mining Co. has begun production of uranium ore at its newly-opened mine near Uravan on the Colorado Plateau. **Page 132.**

A new source of uranium, columbium, tantalum, thorium and monazite is being developed in Bear Valley about 95 mi north of Boise. **Page 136.**

Inland Steel Co.'s fluorspar operations in the Illinois-Kentucky mining district have been halted. **Page 140.**

International Nickel Company of Canada is conducting exploratory drilling in Lake County, Minn. **Page 142.**

An unusual method of obtaining entrance rights on land which may bear uranium has been developed in Utah. **Page 145.**

Start of construction on Canadian National Railway's branch line to Chibougamau has sparked a new burst of prospecting activity in that district. **Page 148.**

Ontario's lone asbestos mine, Canadian Johns-Manville's Munro property, near Matheson, is going underground. **Page 150.**

MacLeod-Cockshutt reports a new gold orebody and a new uranium prospect. **Page 154.**

Sherritt Gordon Mines Ltd. reports that initial results of its nickel-copper process were up to expectations. **Page 156.**

Rumors persist that Bolivia is going to erect a domestic tin smelter, probably with German technological assistance. **Page 162.**

Value of African gold production reached a new peak in May—$38-million. **Page 164.**

New plans are under consideration to solve transportation problems relating to rich iron ore deposits of Mauritania. **Page 166.**

Two important uranium discoveries have been announced by South Australian authorities. **Page 168.**

Workmen are rushing completion of buildings to house the 4000-ton mill at the Toledo copper mine in the Philippines. **Page 174.**

An "atomic city" is planned by the East German government near Aue, Saxony, where two reactors will consume about 12 metric tons of uranium a year. **Page 175.**

Tahehan Tungsten Corp., owned by the South Korean government, resumed mining at two of its mines July 1. **Page 177.**

Egypt's National Production Council has signed an agreement with a West German firm under which vast iron ore deposits as Asway will be utilized. **Page 178.**

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IN THE U. S.

ALASKA

Admiralty-Alaska was reportedly negotiating for an airborne magnetometer survey of its Funter Bay nickel-copper deposit as a means of directing future underground development work. This will be the second such survey, the first being the Yakobi Island survey of last year by Lundberg Explorations Ltd. for E. Miles Flynn & Associates.

T. P. Lane, manager of the operation, states that completion of the mill at Big Hurrah gold lode mines 35 mi east of Nome was delayed by fire which destroyed part of the building and some of the machinery.

Coast Range Exploration Co. has established a base camp on a boat and is working in the Ketchikan and Juneau districts. The search for strategic metals will continue until winter halts operations. Company is headed by Edward A. Smith, of Anchorage.

Property of Livengood Placers Inc., 80 mi northwest of Fairbanks, has been sold by RFC to satisfy a Government loan. The property included more than 250 gold mining claims, buildings, machinery, equipment and a large dredge. Bids were to be sent to RFC by June 22. Mining was suspended by Government order in 1952. The company had operated periodically from 1940 to 1950.

Pat Bliss and Charles Moon of Nome planned to take supplies 200 mi by caterpillar via Cape Nome, Solomon and across Fish River flats to their Granite Mountain claims in the Haycock Area on Sweepstake Creek. Bliss expects to use his own plane to supply mine needs.

ARIZONA

A potential copper development exists in the White Mesa area of the Navajo Reservation, University of Arizona geologists reported.

Some 16-million tons of proven copper ore are available on the Mesa, according to Prof. George A. Kiersch, who was in charge of a survey of mineral resources made for the Indian Bureau.

Professor Kiersch said that the huge ore deposit is only 19 mi from the site of the proposed Glenn Canyon Dam on the Colorado River. This would provide an excellent source of mining water supply, he pointed out.

The mineral survey report mentioned also "potential copper development channels" in the Paikte, Nakai and Cooper Canyons and in the Monument Valley region of Arizona and Utah.

G. Warren Spaulding, reservation general superintendent, said that prospectors for mining companies are being invited to examine the report.

A $200,000 pilot plant to process tailings from the Iron King mine at Humboldt in Yavapai County is underway.

The plant will process tailings from the mine into fertilizer and other compounds. Tailings also will yield iron, silver, and gold. Should the pilot plant prove successful, expansion totaling more than $1-million is planned.

Shaft-sinking and construction are on schedule at Magma Copper Co.'s San Manuel property at Tiger.

Headframe atop service shaft

Two production shafts will be sunk to 1800 ft and a man and service shaft will be sunk to 1600 ft. At the end of May, one production shaft was completed down to 459 ft, the other completed to 291 ft and the man-service shaft was completed down to 813 ft. This third shaft is being sunk at an average of 150 ft a month and it is expected that it will be completed by year's end.

Underground activities are centered in driving development and haulage levels. Three main levels are to be established: 1475 ft; 2075 ft, and 2675 ft.

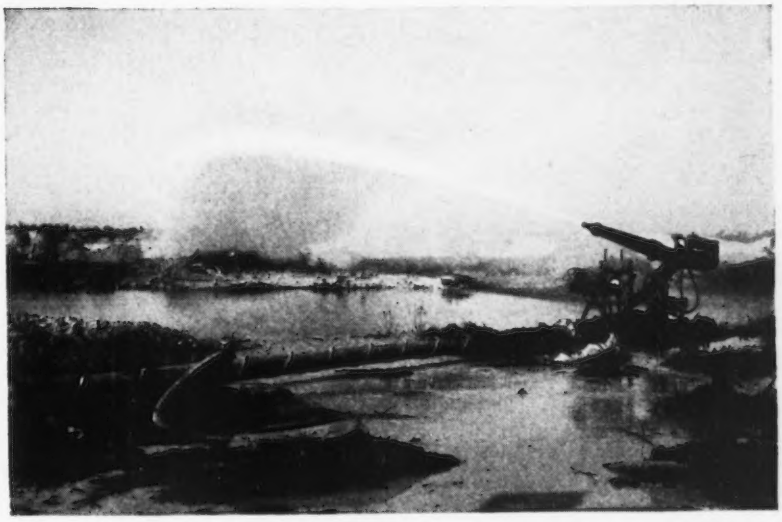
The production shafts and reduction works under construction will be connected by a 7-mi rail line. Surface plant structures completed recently near the service shaft site include steel headframe and hoisting plant proper, repair shops, compressor building and a warehouse.

At the reduction works site, rapid progress is being made on foundations of different plant units, some of which are nearing completion. At the townsite, some 1000 homes are ready for occupancy and several hundred families already have moved in.

The 30-mi rail line under construction between the reduction works and the Southern Pacific main line at Hayden is expected to be completed by the end of 1954. All heavy equipment and materials needed at the reduction works site will then be moved over this line.

Mine, concentrator, smelter and power plant are to be placed in operation early in 1956. Mine output is to be 30,000 tons daily on a 6-day work-week basis. Orebody at San Manuel boasts 367-million tons of sulphide ore of 0.785% Cu grade. Total capital investment is expected to exceed $120-million. Wesley P. Goss is president-general manager.

THE PIPE THAT PUTS WATER TO WORK



You can depend on Naylor pipe to put water to work for you. In hydraulic mining operations, the familiar lockseamed-spiralwelded structure of Naylor distinguishes it from all other light-weight pipe—not only in appearance, but in performance. It's this exclusive structure that provides the extra strength and safety that permit the use of lighter wall pipe in heavy-duty service. That's why Naylor is the preferred light-weight pipe in all types of mining applications—for high and low pressure air and water, and for material handling. Write for Bulletin No. 507.

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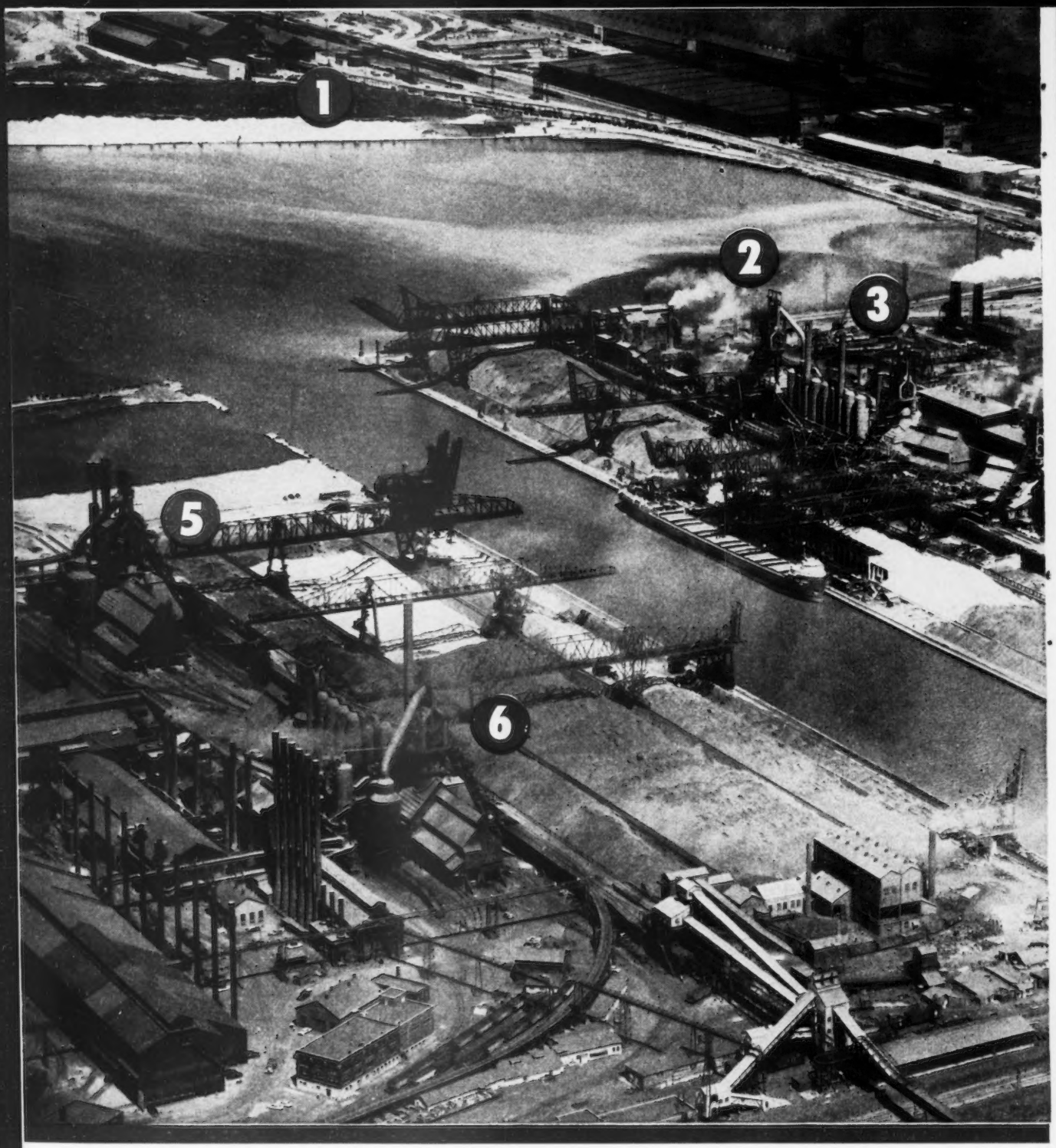


1 Inland Steel Company's No. 3 Open-Hearth Shop was designed and built by McKee in 1952. Capacity of the four furnaces is 750,000 tons annually with provision for future expansion.

2 Inland No. 6 Blast Furnace designed and constructed in 1942 by McKee. With a 25′ 9″ hearth diameter, this furnace has a 450,000 ton capacity.

3 Inland No. 5 Blast Furnace, completed in 1938, was designed and built by McKee. Hearth diameter is 25′ 9″ and annual capacity 450,000 tons.

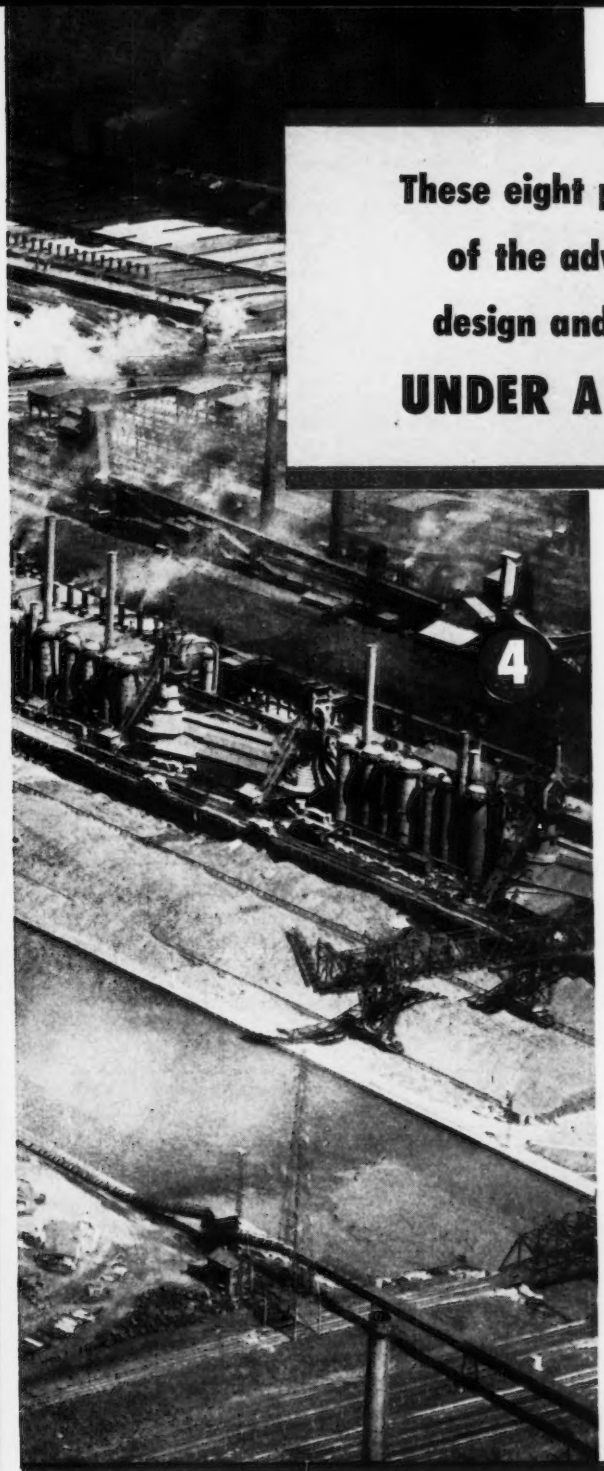
4 Inland No. 1 Blast Furnace was completely dismantled, redesigned and rebuilt by McKee in 1939. Annual production capacity is 300,000 tons. No. 1 Furnace has a 20-foot hearth diameter.

5 Youngstown Sheet & Tube Company's No. 3 Blast Furnace was completed in 1953. Designed and constructed by McKee, this furnace has a 28-foot hearth diameter and an annual capacity of 550,000 tons.

6 Youngstown No. 1 Blast Furnace, completed in 1948, was designed and built by McKee. Capacity is 480,000 tons annually, hearth diameter 26 feet.

These eight plants are good examples of the advantages you get from design and construction by McKee

UNDER A SINGLE CONTRACT



HERE, in a relatively small area, are eleven blast furnaces and an open-hearth shop. Seven of the blast furnaces and the four-furnace open-hearth shop were designed and constructed by Arthur G. McKee & Company on the basis of unit responsibility.

The Iron and Steel Industry and the Petroleum Processing Industry use McKee services and McKee undivided responsibility on large-scale projects all over the world. Here's why:

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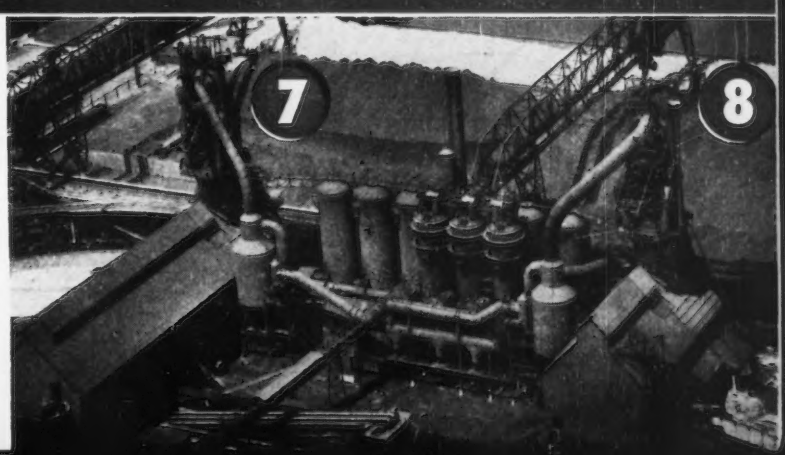
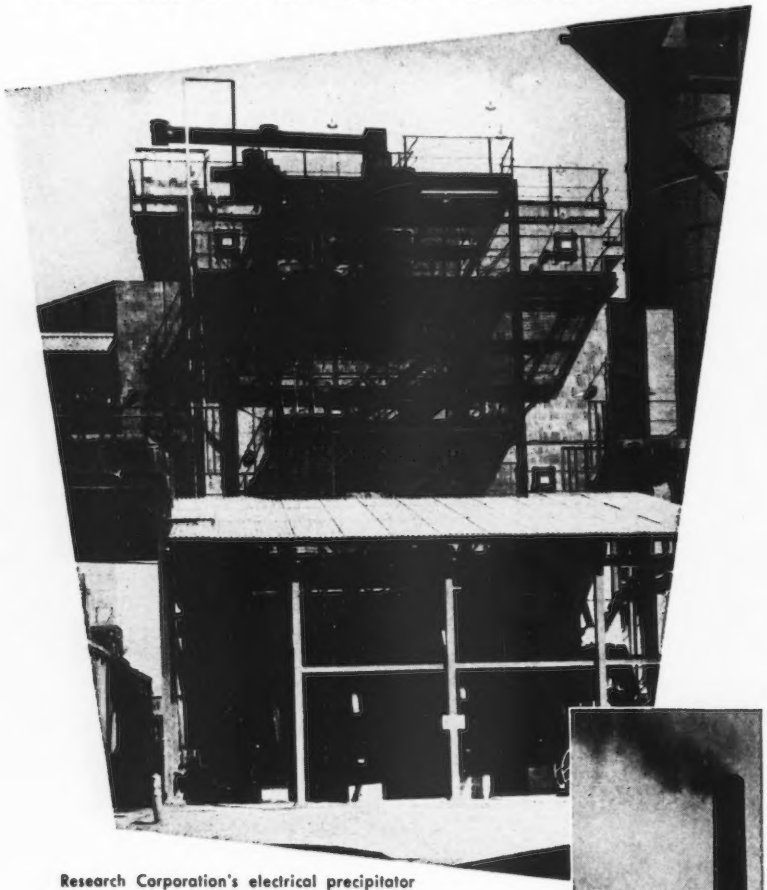
7 Inland Blast Furnace A at Plant No. 3 has a 25′ 9″ hearth diameter and a capacity of 450,000 tons. Designed and built by McKee, it was completed in 1943.

8 Inland Blast Furnace B at Plant No. 3. Built at the same time as Furnace A, it has the same hearth size and capacity. These two furnaces form one of five sets of "twins" designed and built by McKee.

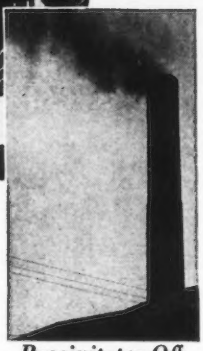


New Jersey Zinc

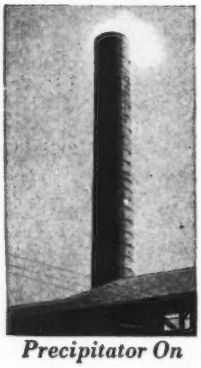
Recovers Values from Fume



Research Corporation's electrical precipitator installation at the Palmerton, Pa. plant.



Precipitator Off



Precipitator On

The two photographs (right) show the results of this Research Corporation installation. The smoke in the picture at the top (Precipitator Off) consists of dry dust and fume entrained in the zinc ore sintering machine gases.

The picture at the bottom (Precipitator On) shows nothing but water vapor escaping from the same stack.

If you have a fume problem that involves recovering valuable materials that are going up the stack or combating a smoke nuisance, get in touch with your nearest Research Corporation representative. His experience with over 300 roaster and metallurgical precipitators will enable him to advise you on the most effective—and economical solution to your problem.

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CALIFORNIA

Bradley Mining Co., San Francisco, reportedly has developed a process which will increase availability of specially refined antimony metal with a purity of 99.998% for use in the investigations of antimony semiconducting compounds.

Due in part to investigations sponsored by the Bradley Mining Co. at the Battelle Memorial Institute, Columbus, Ohio, a large interest has been stimulated in research on the semiconducting antimonides.

In addition to supplying high purity antimony for semiconductor research in the United States, the Bradley Mining Co. has also been exporting this material to Australia, Israel, Norway and the United Kingdom.

Idaho Maryland Mines Corp., Grass Valley, has negotiated a lease agreement with an unidentified group holding uranium claims near Moab, Utah. Involved are about 1165 acres, or 55 mining claims, 30 mi south of Moab.

Bert C. Austin, Idaho Maryland president, said that geophysical work on the claims was to start late in July, to be followed by drilling.

COLORADO

Shattuck Denn Mining Co. has started production of uranium ore at its newly-opened mine near Uravan, on the Colorado Plateau.

The mine is on 160 acres of land leased from the Atomic Energy Commission. AEC had explored the ground by diamond drilling and other tests and found the ore. On the strength of the data disclosed, the company has spent nearly $200,000 on development, including the sinking of a 500 foot shaft. Regular shipments of ore began April 1.

AEC contract with Vitro Uranium Co. for operation of a uranium ore processing mill at Salt Lake City has been renewed for 5 yr. The Salt Lake City mill is one of 7 producing concentrates from uranium ores for AEC.

Minerals Engineering Co. at Grand Junction announced expansion of the firm into contract mining, and the addition of two executives.

Thomas W. Holmes has been named assistant general manager. Holmes for the past eight years was the mine superintendent for U.S. Vanadium Co. at Bishop, Calif. William Latham, foreman at Bishop under Holmes, has been chosen to head the new contract mining department. The contract department is starting with six engineers and mine foremen.

Bids on two drilling projects for AEC were opened at the Grand Junction operations office. Apparent low bidder on 15,000 ft of exploratory drilling in the Sanastee area of San Juan county, N.M., was Minerals Engineering Co. of Grand Junction at $55,970 for an average of $3.73 a ft. On a project for

18,000 ft of drilling in the Coal Creek area of Rio Blanco county, eight bids were received. Apparently low was E. P. Webb, Midwest City, Oklahoma at $44,531 for an average of $2.47 per ft.

A four-man crew from the U.S. Geological Survey has started geologic mapping in the Telluride area. According to A. L. Bush, who is in charge, they are in the process of mapping about 300 sq mi.

Structures in the area will be mapped, with the general objective of understanding where and how the ore deposits are formed, mainly lead, zinc, gold, silver, vanadium and uranium. This project will require several years to complete.

Average of 12 ft per day is being made on drilling of a 350 ft tunnel on the Hoskinson uranium claims near Fish Creek Falls. Work on the tunnel began in May and is expected to show within a few weeks whether ore is of commercial value. Additional claims were staked when snow began to leave the high country.

Frank Schrick of Columbus, Ohio, was in Denver completing arrangements for milling operations at his company's flotation plant in the Alma District.

He states that they have formed the Colorado Reduction Corp. and have taken over the old Record mill 5 mi from Alma and that plant started treating ore July 15. Ed Moynahan of Denver is consulting engineer for the company and Ed Lanigan of Alma is manager.

Atomic Uranium Corp. with offices at Ardsley, N.Y., is carrying on important development plans for the atomic ore production on an historical uranium group of properties in Gilpin and Clear Creek counties. The corporation is the assignee of over 100 mining claims on the front range of Colorado on the eastern side of the Continental Divide. Francis H. Knighton of Ardsley is general manager and chairman of the board. Dr. G. C. Ridland of Denver is engineer.

IDAHO

An offer by Bunker Hill & Sullivan Mining & Concentrating Co. and Hecla Mining Co. to explore and develop the vast property of Silver Mountain Lead Mines Inc., in the Coeur d'Alene District east of Mullan on a profit-sharing basis was accepted by Silver Mountain stockholders early in June and a $25,000 diamond drilling program provided for in the development contract is now in progress.

The program, to be completed this year, provides for three 1000-ft downholes at 2000-ft intervals across the east-west length of the property for the purpose of obtaining geological information for a deep development project.

Present plans of the operating companies call for a 2000-ft shaft and some 8000 ft of lateral exploration at that horizon. Underground work will be started by April 1, 1955, under the contract.

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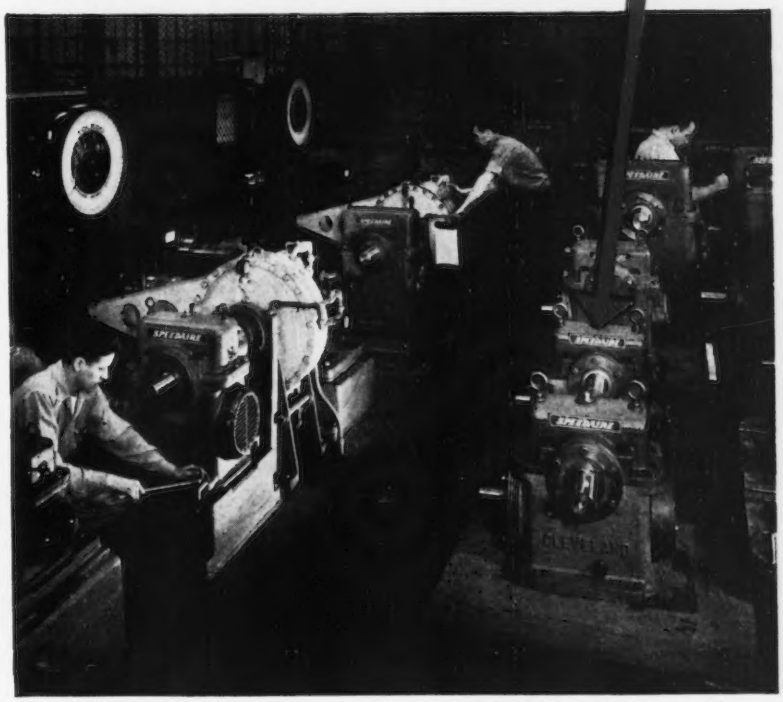

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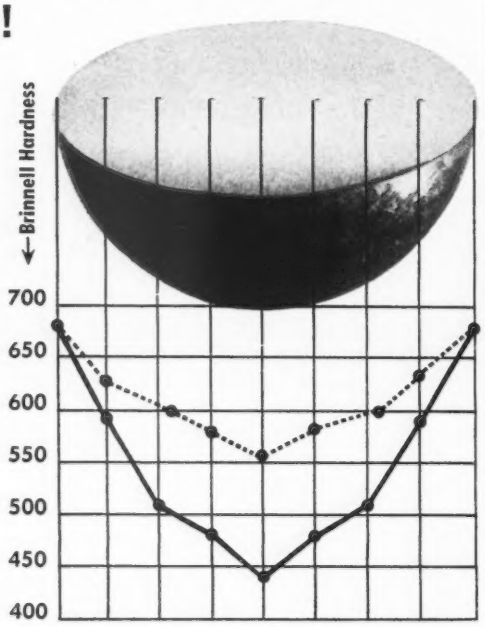

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AFCO PRODUCTS

Idaho *(Continued)*

The project is expected to cost well over $1-million. When the operating firms have spent $1-million on the property, or when commercial ore is found—which ever occurs first—they will each receive 37½% interest in the property. Silver Mountain will retain a 25% interest.

Sullivan Mining Co., jointly-owned by Bunker Hill and Hecla, has surrendered a previous development agreement with the Silver Mountain firm.

Salmon River Scheelite Corp. has been organized by central Idaho interests to develop the Tungsten Jim and Scheelite Nellie deposits in Custer County, on Thompson Creek above Clayton.

Incorporators are Robert W. Faris, Arco, who serves as president and purchasing agent; Jim Clutis, Salmon, who is mine superintendent and acting secretary-treasurer; and Clinton Gunderson, Mackay, who is in charge of road building and transportation.

An orebody 20 ft long by 20 ft high by 400 ft long already has been blocked out by stripping and will be mined by open-pit methods. Plans are to have test mill-runs made at several concentrators to determine where the best and most economical recovery can be made. The property is owned by Jim and Don Clutis and Don Lemon of Salmon.

Goldstone Mining Co. has resumed operations, after a winter shutdown, at its gold property in Lemhi County near Salmon. The new lower adit, started in 1948, is being extended and the face, now nearly 2000 ft, is believed to be within 100 ft of the downward extension of the Goldstone vein which was stoped from upper workings. The new adit is 400 ft deeper.

Sunshine Mining company, the nation's leading silver producer, also led the country in antimony production in 1953 and was the only substantial producer of the metal in the United States, according to U. S. Bureau of Mines reports.

Sunshine last year turned out 361 tons of electrolytic antimony as a by-product of silver-copper production. The company reactivated its antimony workings early in 1953 principally for the purpose of removing from silver-copper concentrates an antimony content which was heavily penalized by smelting plants.

Sidney Mining Co. is planning to sink the three-compartment No. 3 shaft at its Pine Creek area property in the Coeur d'Alene District directly from the 1700 to the 2300 level and explore the Sidney vein zone from end-line to end-line on the lower horizon.

The additional depth, officials believe, will by-pass a barren zone which starts above the 1300 level and is believed to extend downward for 500 to 600 ft. Mine workings above the main adit (900) level have been leased out under a block-leasing system.

Sun Valley Mining Corp., a Delaware firm headed by Louis Van Zatzman of New York, has purchased at bankruptcy

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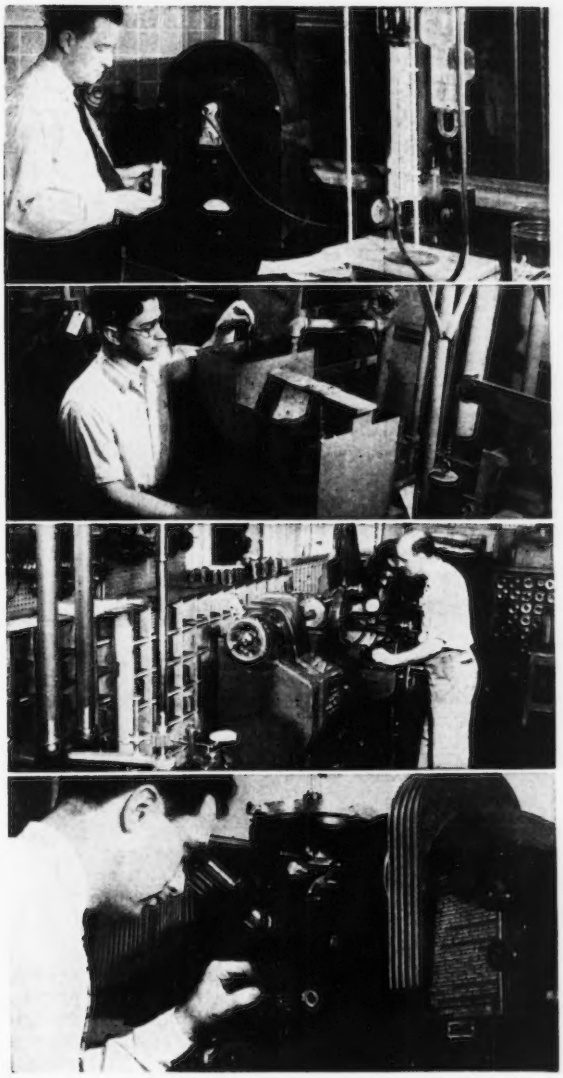

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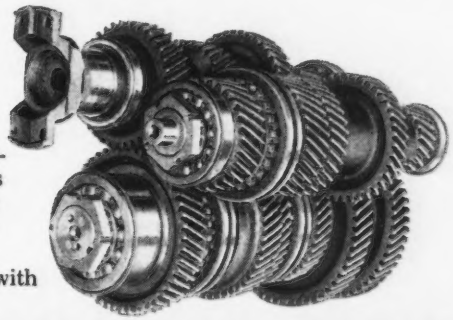
To help insure complete control over the quality of finished gears, all steel must meet specified hardening characteristics, determined here by the "End Quench Hardenability Test."

Dimension Test

Cutting tools used to make the gears, as well as the gears themselves, are measured in the gear laboratory. With this precise dimension control, Allis-Chalmers can mass-produce gears that are correct to 1/10,000 of an inch.

Metal Grain Test

Sections cut from finished gears are examined under metallurgical microscopes which magnify from 10 to 2,000 times. This test gives assurance of proper and uniform quality of grain structures in hardened gears.



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Idaho *(Continued)*

sale the Blaine County properties of Apache Mines Co., including the Red Elephant, Bay State and Valley View mines, the Tug Wilson estate and numerous other claims, together with the Apache mill on Bullion Gulch,

A crew of 10 men under the direction of Emmett A. Yaden of Hailey has installed new equipment and underground work has been in progress since mid-June.

Some sizeable bodies of direct-shipping ore are being mined. Milling-grade ore will be held until a thorough overhauling of the mill is completed. When the mill is put into operation, the company expects to provide employment for at least 30 to 40 men.

A new source of uranium, columbium, tantalum, thorium and monazite in Bear Valley about 95 mi north of Boise is being developed by Porter Bros. Corp., according to President Robert P. Porter.

Late last fall the company began construction of dredges to work the 11,500 acres in the valley at the rate of about 2.5-million cu yd a year. A processing plant for dredge production is expected to be ready for operation by September.

Present indications are that it will take about 28 years to work all of the new ground.

Stockholders of Lucky Friday Extension Mining Co. have ratified an agreement with Lucky Friday Silver-Lead Mines Co. which provides for deep-level exploration and development of their 10-claim property adoining the Lucky Friday Mine east of Mullan on a profit-sharing basis.

Also ratified was an agreement with Day Mines Inc., settling claim conflicts and granting the right to use underground openings driven by Lucky Friday Silver-Lead into Day Mines' Gold Hunter tract for the purpose of exploring Lucky Friday Extension claims at depth.

Under the development contract Lucky Friday Silver-Lead agrees to explore and develop Extension ground for a 60% interest in any ore found.

Sungold Mines Inc., resumed development work in early June at its property on Summit Flats in Idaho County and has six men employed extending development tunnels and making preparations for operation of the concentrator installed last summer.

Leasing contractors have started sinking an inclined shaft on the ore disclosed last year near the portal of the adit tunnel at the Idaho Goldfields' property in Fourth of July Canyon between Kellogg and Coeur d'Alene.

They are following the ore downward on its dip, stockpiling, for the time being, high-grade lead-silver ore removed as the heading is advanced.

Primitive Exploration & Finding Co.'s property in Blaine County, at the head of Rock Creek west of Hailey, is the best lode uranium prospect thus far found in Idaho, according to State Mine Inspector George McDowell.

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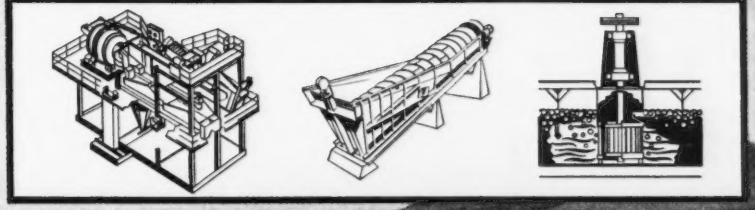

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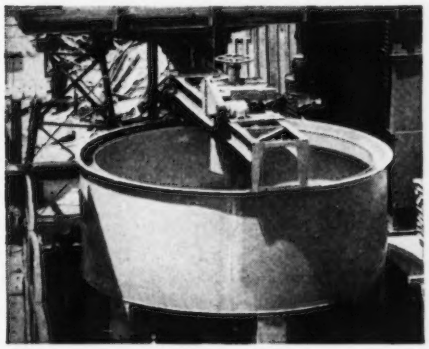

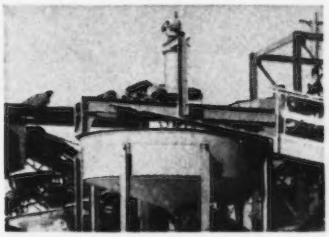

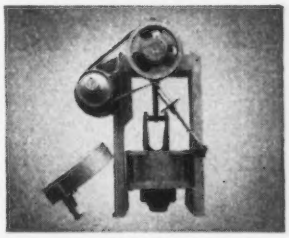

WEMCO THICKENERS:

Sizes and Types: WEMCO Thickeners are job-tailored to specific applications and are available in sizes up to 400' diameter. Job requirements determine use of Beam (up to 45'), Lo-Truss (32' to 60'), Hi-Truss (60' to 100'), Center Pier (75' to 175') or Traction (125' to 400') type of construction.

Features: Depending on application, WEMCO Thickeners offer a wide choice of construction and mechanical features. These include: heavy duty worm or spur gear mechanisms and bearings; large feed wells; strong cast spiders; overload alarms; manual or motorized screw lifting devices on small sizes; vertical hydraulic lift on Center Pier type; chain and sprocket gear-motor drive on small sizes; dual fluid drive on Center Pier and Traction types; large diameter discharge cones; wood or steel tanks.

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Sizes and Types: WEMCO Hydroseparators are available in sizes up to 100' diameter. Duty requirements determine use of Beam (up to 40'), Lo-Truss (35' to 55'), or Hi-Truss (55' to 100') type of construction.

Features: Depending on job requirements, WEMCO Hydroseparators offer a wide range of construction and mechanical features, including: heavy duty worm gear mechanisms and bearings, large diameter cold rolled steel shafts, large feed wells and discharge cones, strong cast spiders, manual or motorized lifting devices and efficient drive arrangements.

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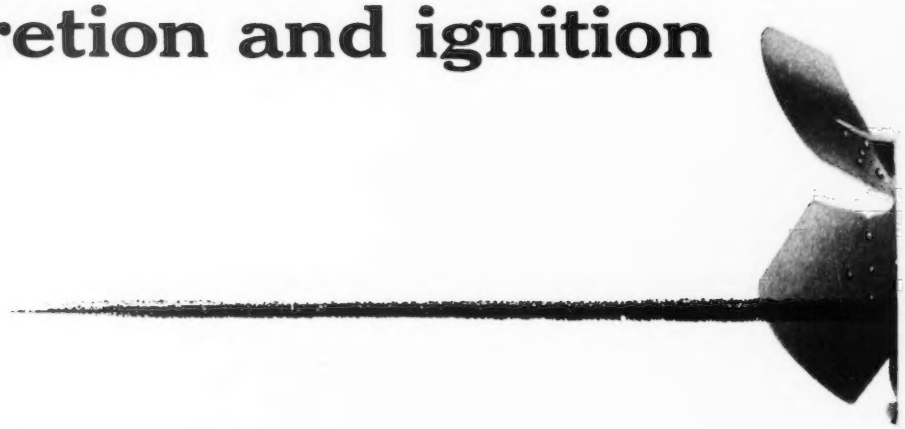

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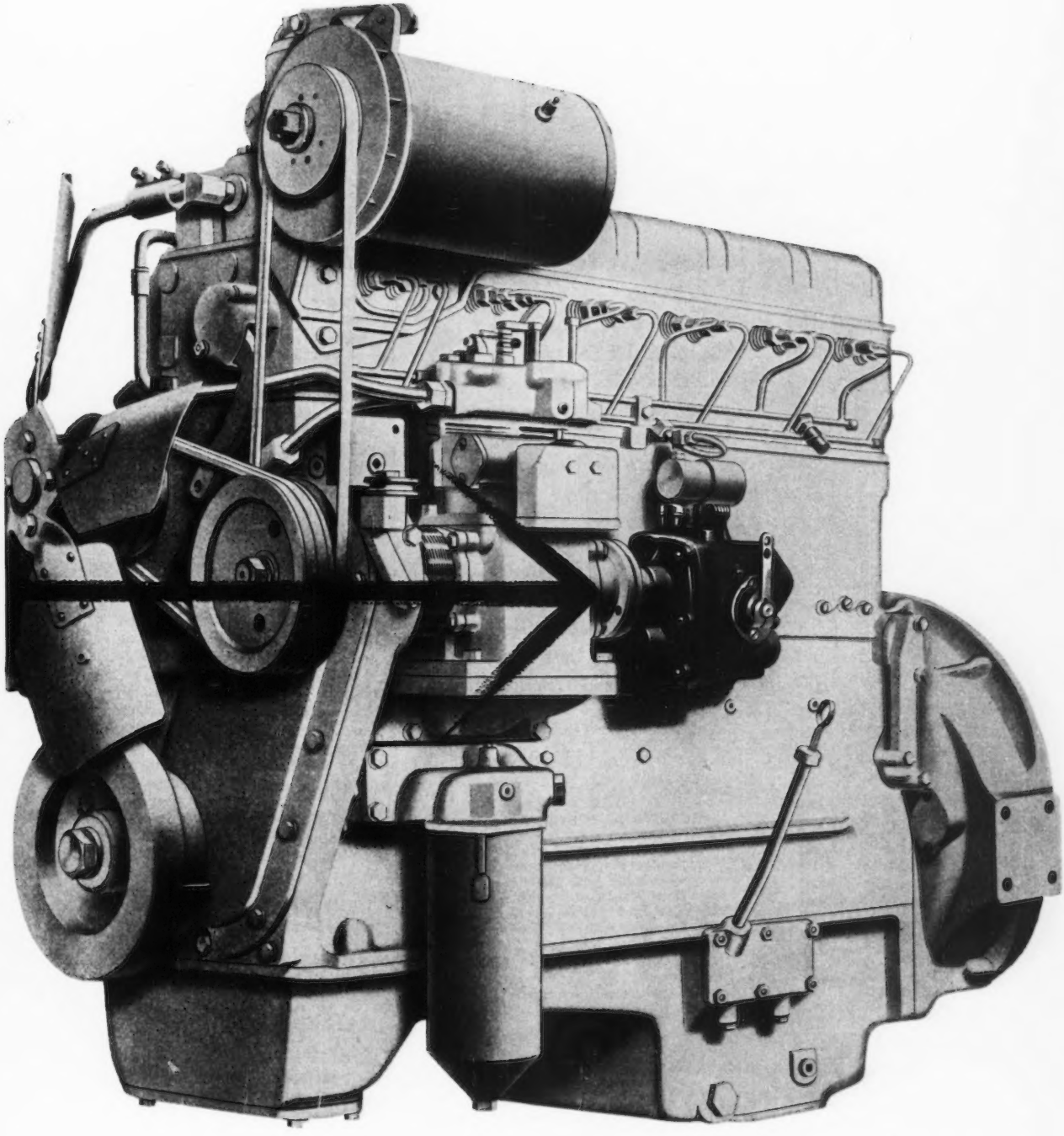

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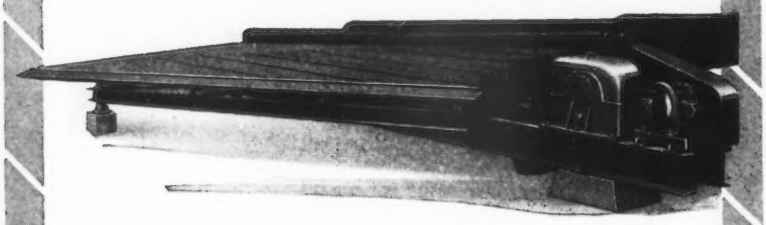

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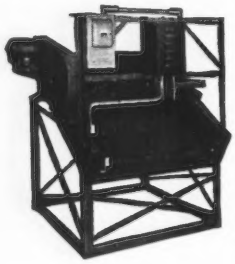

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Idaho *(Continued)*

The ore found in a quartz vein on the property is autunite, he said. Initial assays of samples taken from five different places along the veins showed 0.15 to 0.35% uranium oxide with about an equal percentage of thorium. This is commercial grade, but whether the quantity is sufficient for a commercial underground operation remains to be determined.

Several major mining companies are said to be interested in the area since Atomic Energy Commission officials found the discovery promising enough to justify a personal inspection of it. Diamond drilling to explore the extent of the deposits is underway.

Cordero Mining Co. is preparing to start production at the Wildhorse tungsten property, which is located in Blaine County over Trail Creek Summit from Hailey.

A boarding house, bunkhouse and mine office have been built, equipment for a sizeable mining operation is being installed and a mill is under construction. Mining operations are already underway and ore is being stockpiled until the concentrator is completed.

A vein of lead carbonate ore 2 ft wide assaying about 60% lead and one-half oz of silver per ton has been found outcropping on the surface of the 10-claim Liberty property at the head of Cougar Gulch in the Coeur d'Alene district near Murray.

The cropping has been stripped for a distance of about 90 ft along its strike and owner Richard D. Riegel of Spokane is planning to mine it by open-pit methods. Surface exposure is the outcropping of a vein opened last summer by extending for only 20 ft a 900 ft exploration tunnel driven by early-day prospectors.

On the tunnel level the vein has been drifted out for a distance of 350 ft at a depth of 270 ft below the surface. It ranges from 8 in. to 7 ft in width and averages 14% lead and 3 oz of silver to the ton. A raise has been driven 70 ft in ore.

Riegel is said to be considering construction of a 100-ton mill to process his own ore and handle production from other near-by properties on a custom basis.

ILLINOIS-KENTUCKY

Inland Steel Co.'s fluorspar operations in the Illinois-Kentucky mining district were abandoned with the final shutdown of the Keystone mine in the Kentucky field June 12.

Most of the equipment, mining machinery, and supplies on hand were shipped to sites of other Inland plants. The company's heavy media separation mill was purchased by W. G. Robinson, Marion, Ky., former Keystone superintendent.

Closing of the Keystone terminated 32 years of service with Inland for Earl T. Galloway, Elizabethtown, Ill., including

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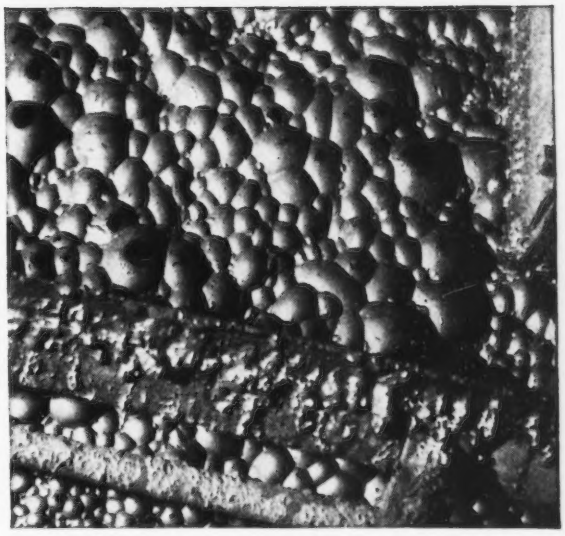

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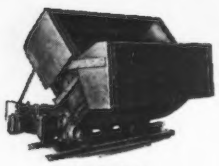

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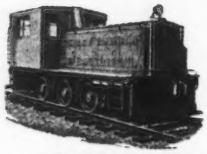

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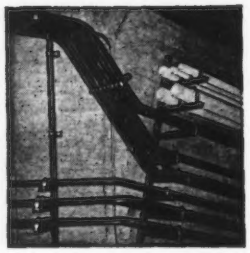
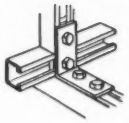
We'll be glad to help you select the right equipment for your particular job. Just send particulars to our Research Department. Our engineers will be glad to give you the benefit of their experience without cost or obligation. Just write—Department J





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Illinois-Kentucky *(Continued)*

28 yr as purchasing agent and 4 yr as chief clerk. Inland also formerly operated the Hillside fluorspar mine in Rosiclare, Ill.

Rosiclare Lead & Fluorspar Mining Co., Rosiclare, Ill., has pulled the pumps and flooded its Rosiclare mine to the 220-ft level, according to J. Blecheisen, president.

All damageable underground equipment has been removed. There is no definite date for de-watering the mine, and resumption of mining will depend upon an improved market outlook. Cost saving will be appreciable. Milling continues at present with filling of current orders from ore on surface.

Water will be held at the 220-ft level so that the soft ground orebodies above may be mined.

MICHIGAN

Construction is on schedule at the White Pine low-grade copper project of Copper Range Co. (*E&MJ*, January 1953, p 72). Project was about 85% completed as of July 15. An increase on the original estimate brings the new total estimated expenditure to $62,826,598.

Ishpeming celebrated the centennial of its founding July 25-31. July 28 was observed as "Iron Ore Day". Festivities included visits to iron mines, industrial exhibitions and drilling contests.

MINNESOTA

International Nickel Co. of Canada is conducting exploratory drilling with two diamond drills about 12 mi southeast of Ely in Lake County. Lands to be explored are under option from the Whiteside-Childers interests and are within the Superior National Forest area. The presence of nickel in this area has been known for some time but little drilling has been done and results have not been made public.

Minerals Benefication Sub Section, Minnesota Section of the American Institute of Mining & Metallurgical Engineers, held its June meeting at Virginia on the 16th. New officers elected were: Earl C. Herkenhoff of Pickands, Mather & Co., chairman, succeeding Milton F. Williams of the Oliver Iron Mining Division; John D. Boentze, Pacific Isle Mining Co., was elected vice-chairman and Richard W. Livingston, chief beneficiation engineer for the Minnesota Ore Division of the Jones & Laughlin Steel Corp., secretary-treasurer.

Grant Fleck, assistant manager of Benson Mines of Jones & Laughlin Steel Corp., New York Ore Division, at Star Lake, N. Y., was guest speaker. His talk, which covered the Benson Mines operation, was accompanied by slides of the mine and plant.

Pickands, Mather & Co. has awarded a

contract to Western-Knapp Engineering Co., Hibbing, for construction of a new 300-ton-per-hour washing and heavy media plant for its Bennett open pit mine at Keewatin. The Bennett underground mine has been exhausted and was closed.

M. A. Hanna Co.'s new North Yawkey Mine began ore shipments in June. Some 1.9-million cu yd of stripping had been removed since July 1953. The property is on the Cuyuna Range and corners on the Manuel Mine of Zontelli Brothers. It contains an estimated 415,570 tons.

Mahoning Mine at Hibbing, operated by Pickands, Mather & Co., has been awarded the "Sentinels of Safety" trophy for 1953 for the eighth time. The Mahoning operated a total of 733,666 manhours during 1953 without a lost time or disabling accident. E. J. Fearing is general superintendent for P. M. & Co. in the Hibbing area; W. D. Webb is superintendent of the Mahoning Mine. Pickands, Mather was one of the first companies to have a full safety department.

A 19-yr-old car dropper at a Mesabi mine suffered an accident which resulted in both legs being amputated above the knees.

In a district court suit brought against the Morton Ore Co., a claim for damages alleged to have been caused to a nearby home from mine blasting was rejected and a verdict was brought in for the defending company.

The 1953 report of St. Louis County mine inspector, Ben Kangas, shows 60,776,174 tons of ore was taken from County mines during the year. This was over 12½-million tons more than the 1952 figure. 12,079 men were employed at 122 mines at hourly rates ranging from $1.52 to $2.56½. There were four fatal and 215 non-fatal accidents during the year.

The 10th annual meeting of the Open Pit Mining Association, Electrical Division, was held in Hibbing, July 1 and 2. About 175 men attended. Francis M. Bohan, electrical supervisor of Minnesota mines for the M. A. Hanna Co., president, said that the object of the group is to "advance uniform standards of applied electricity in connection with open pit mining, and to promote the development of necessary safety devices for the protection of operating personnel and equipment."

MONTANA

Montana Supreme Court on May 5 unanimously decided that the additional 9% intrastate freight rate that five major railroads had been collecting on all freight, except livestock moving within Montana, is an illegal charge.

This may mean that the railroads will have to refund the additional amounts they have charged and collected since Jan. 28, 1953.

Last Chance Gulch Mining Association,

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Ideal for tough loads, high lifts and long center distances. Steel-like in strength, yet highly flexible for easy troughing. Twice as strong as similar gauge cotton belts. Resists deterioration by water, oil, weather. These are only a few of the advantages of the Quaker Mainliner . . . made of multiple ply strong duck, with nylon woven across the width and high strength cotton woven lengthwise. For low cost, top-tonnage conveying, use the Mainliner . . . another Quaker quality product for long wear and top performance.

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Montana *(Continued)*

chapter of the Mining Association of Montana, held its annual dinner-meeting June 3, at the Montana Club, Helena.

Following officers were elected: W. R. Wade, Marysville, Mont., consulting engineer, president; John Brophy, Helena mining operator, vice-president of membership; Finley S. Major, East Helena, AS&R Co., vice president of programs; Donald Johnson, East Helena, AS&R Co., vice-president of publicity. Hugh K. Gaw, Helena public accountant was reelected secretary-treasurer because of his excellent record in that capacity.

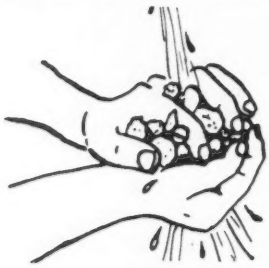
Beverhead Mining Association, affiliate of the Mining Association of Montana, held its annual dinner-meeting at the Andrus Hotel, Dillon, June 30.

Elected were Ernest Nygren, Dillon, manager of Tri-State Minerals Co., president; John Hand, Argenta, owner and operator of Hand Mine, vice-president; Bruce A. Risley, Dillon, public accountant, secretary and John Collins, Dillon attorney, treasurer.

Elected trustees from the various mining districts of Beaverhead County were John Shaffer, Bald Mountain; John Hand, Montana; William Logan, Blue Wing; Tony French, Elkhorn; Ernest Nelson, Utopia; Ernest Nygren, Blacktail; F. C. Herr, Bannack; Arthur Conway, Badger Pass and William Tobey, superintendent Minerals Eng. Co., Vipond.

Bruce Risley was master of ceremonies. Speakers included Dr. F. A. Hames, Butte, head of the department of metallurgy Montana School of Mines and in charge of metallurgy of the Montana Bureau of Mines & Geology; Carl J. Trauerman, Butte, secretary of Mining Association of Montana; Mr. Risley; John Hand, Argenta; Prof. Walter S. March, Jr., Butte, assistant director, Montana Bureau of Mines & Geology and head of the dept of geology of the Montana School of Mines; George Gosman, Dillon business man and Lieutenant-Governor of Montana; William Tobey and Robert Roby, Glen, Montana, respectively superintendent and mine superintendent of the Minerals Engineering Co. **DMPA has approved a $26,631 loan to Radon Research Corp.,** Boulder, for a $34,175 uranium exploration project at the Red Rock Mine in Jefferson County near Basin. The funds will be used to drive tunnels beneath an encouraging surface exposure of radioactive ore.

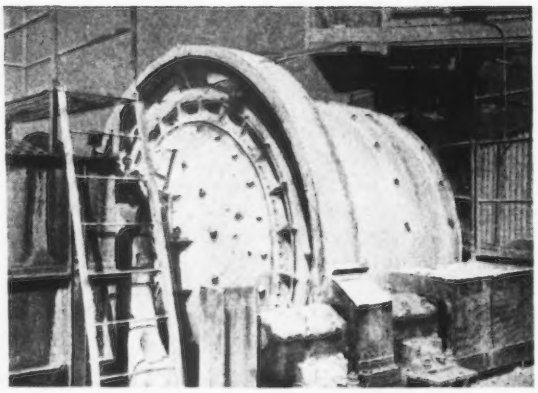
What is
Mass Action
in Ore Scrubbing?



"Mass Action in a HARDINGE CONICAL SCRUBBER is similar to the effect obtained by rubbing a handful of pebbles between the palms in a stream of water.

This scrubber is capable of removing a very hard clay from ores, phosphate rock, gravel, etc., in a very short time with only nominal wear in the machine itself.

Write for Bulletin 37-A-1 and give us pertinent details of your scrubbing problem.



View of a 10' x 66" Hardinge Scrubber cleaning crushed dolomite in a California plant. The trommel screen is at the left.

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NEVADA

Anaconda Copper Co. is now producing 5-million lb of copper per month at its Weed Heights property near Yerington. The plant has been in operation since November. The plant for production of sulphuric acid is operated seven days per week as is the leaching plant. Mining is on a five-day week. The operation is adding to Nevada's copper production at the rate of 30,000 tons per year (see special article, p 72).

Ore is being moved at three points in the Summit King silver mine north of Tonopah, and a wide range of values is being encountered, according to Frank Kennicott, superintendent. Bulk of the ore is being shipped at the rate of 40 tons daily, and is coming from two stopes on the 300-ft level where a large vein has been blocked out. Third scene of activity is a raise at the 425-ft level which is now up to the 450-ft mark.

Members of the Reno subsection of American Institute of Mining & Metallurgical Engineers were shown the first geologic map of Nevada ever made during their June meeting. The map is the work of E. L. Stephenson, of Reno, consulting geophysicist and geologist.

Nevada Scheelite Mine, 54 mi southeast of Fallon, is producing a good quantity of ore from the 300-ft and 400-ft levels, and reportedly now has a larger and better reserve of tungsten ore than it had three years ago when it was bought to become a division of Kennametal, Inc.

E. M. Conwell, general manager at the mine and mill, said the company is now ready to sink a winze from the 400-ft to the 500-ft level. Production during the last six months has increased from 2500 units to 3000 units monthly,

and the mill is currently handling 120 tons of ore daily. The 115 employees live with their families in a small community at the mine site. Water is pumped from a well 3½ mi south of the town.

OREGON

Ore from A. O. Craig's chrome deposit in the Briggs Creek area of Josephine County is being concentrated at the Six Mile chromite mill owned by Roy Jackson and Jean Pressler. The outcrop of chrome is about 3 ft wide, 5 ft long. The deposit occurs in a body of serpentine about 250 ft wide. Mine is near Schoolhouse Flat.

Sanger gold mine in Baker County is being readied for operations. William Wendt, owner, put in a 5-ton test mill at the property in 1953. A group having a working agreement with Wendt, plans to mine and mill ore from a shoot on a new vein and also to do prospecting on other parts of the holdings. Tailings will be kept for future cyaniding.

An outcrop of chrome 3 ft wide and 5 ft long was discovered this spring by A. O. Craig, of Selma, on a ridge near Schoolhouse Flat in the Briggs Creek area of Josephine County. The occurence is in a 250-ft wide body of serpentine. Roy Jackson has constructed a road from the Flat to the property. The ore is being concentrated at the Six Mile chromite mill.

UTAH

Meeting in Salt Lake City, the board of directors of the Rico Argentine Mining Co. announced construction plans for a $1.5-million sulphuric acid plant at the firm's Rico, Colo. property to serve the uranium industry of the Colorado River plateau.

According to board chairman James E. Hogle, the plant would produce 200 tons of sulphuric acid per day, and be in operation by September 1955. Trucks will be utilized to transport acid to uranium mills in a 100 mi radius of Rico, which is within highway range of such milling centers as Monticello, Utah.

Company properties at Rico are reported to contain some 15-million tons of iron pyrites, with 200,000 tons readily accessible in tailing ponds as a by-product of lead-zinc operations.

Potash Chemical Co. is drilling for carnallite and sylvite deposits south of Green River, in Grand County.

Company president N. G. Morgan, reports that Joy Manufacturing Co. is contractor on the diamond core exploration program. The firm has 15,000 to 20,000 acres under potash lease from the federal government in the area, with 250,000 acres under lease elsewhere in Utah and Colorado.

In an unusual step made to secure possible "entrance rights" on land, which may bear uranium, a group of prominent Utahans have filed potash prospecting permits for some 1-million acres of land in San Juan and Grand Counties.

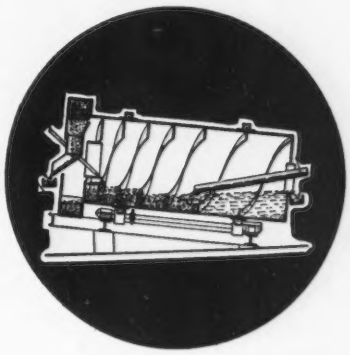
Filings at the Federal Land and Survey Office were in the names of Leland B. Flint, a director of Kennecott Copper Corp., W. K. Malicote, manager, Deseret Livestock Co., auto dealer Ken Garff and other Utah businessmen.

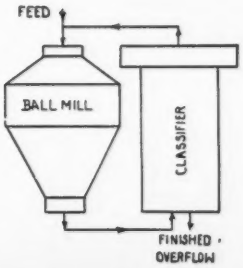
N. G. Morgan, Jr., who has potash leases in the area, stated the filings could help "clarify title" to minerals in southeastern Utah. No effort to "jump claims" is involved, he declared, noting however that "many invalid locations have been made by persons who have no intention of mining uranium," it was reported.

The theory behind the filing action is that no valid claim can be made for uranium, since the Atomic Energy Act of 1946 reserves all uranium for the government; therefore possession rights can be obtained only through prospecting for another mineral. In addition, terms of AEC circular No. 7 include an offer to buy uranium from those prospecting on the public domain under Minerals Leasing Act permits, which include potash.

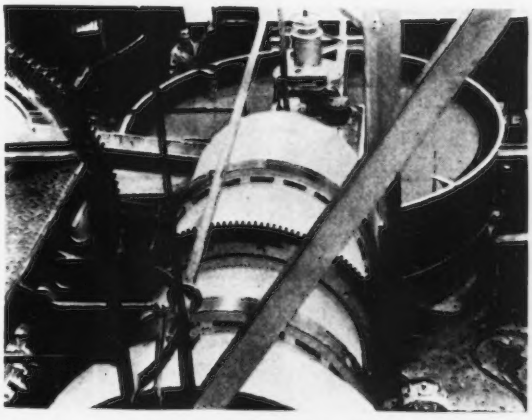
Establishment of a new engineering department for Kennecott Copper Corp's.

What is
Counter-Current
Classification?





"Counter-current" action in the HARDINGE COUNTER - CURRENT CLASSIFIER is based upon the washing and separating effect of a descending stream of wash water on settled granular particles which are being moved upward with a continual agitating, rolling, squeezing movement. The result is very clean oversize — good separation. Bulletin 39-B-1 gives application details of this classifier.



Hardinge 5' x 12' Counter-Current Classifier (foreground), followed by a Hardinge 15' x 3' Hydro-Classifier, in a calcite grinding circuit. A portion of the Hardinge Conical Ball Mill can be seen at the left.

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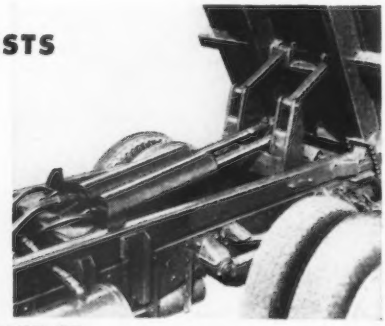
Arm assembly made of structural steel welded to extra heavy reinforced tubing. Hoist frame takes all stresses without transferring any stress to truck frame. Fast, double-acting hoist mechanism elevates body to over 70° dumping angle in a few seconds. Simplified toggle principle design eliminates unnecessary troublesome parts.



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BH-49C

Utah *(Continued)*

western mining division has been announced by J. P. Caulfield, general manager of the corporation's four western divisions.

Caulfield noted that overall engineering and design works had previously been scattered. Their activities will now be centered in Salt Lake City, which will be headquarters for the new engineering department. Some 25 persons will staff the new unit.

While no chief engineer has been named as yet, the first official slated to serve in the new division is Alvin J. Thuli, Jr., who has been named assistant to the chief engineer, western mining divisions.

VIRGINIA

Employees of the Bertha Mineral Division of the New Jersey Zinc Co., at Wytheville have selected CIO United Steel Workers of America as union representative.

Of 435 votes cast, CIO tallied 354. Until the election, the employees had been represented by the American Federation of Labor, which reportedly drew only 68 votes in the recent election.

WASHINGTON

Diamond drilling authorized under Stage II of DMEA's $36,400 contract with Grandview Mines for exploring the Dosser-Maki-Lotze prospects in Stevens County has been approved.

The 2000 ft of drilling already done is said to have outlined a body of pyrite containing scattered quantities of lead-zinc mineralization. It is believed that this mineralization warrants further exploration.

In Stage II, it is planned to add about 3200 ft of diamond drilling. DMEA puts up half the cost to be repaid from production returns.

Border Lord Mining Corp. has resumed operations at its tungsten property west of Loomis in Okanogan County. A new road is being built, a necessary prerequisite to commercial mining. Mill equipment has been packed in and some ore was test crushed. Some materials for an electric light plant were dropped by parachute. A reconditioned air compressor will be taken to the mine over the new road as soon as conditions permit. Thomas Lukens is directing mining and milling.

Contract Milling Co., of Spokane, headed by J. Stanley Huckaba, Spokane mining engineer, was slated to run tests of its gold-silver-manganese concentrator in June. Mitchell Mining Co. of Mount Vernon, Wash., is operating the Margaret Ann Mine, near Walkerville, Mont., where the concentrator is located. R. J. Seideman, of Butte, is superintendent.

Germania Consolidated Mines Inc., on the northern rim of the Spokane Indian

reservation, is increasing operations as a result of guaranteed government prices.

Worked for half a century, the tungsten mine is being worked by H. W. Traver, who has been developing the Stevens County property since 1938 with a partner, Henry Ewing.

Only 600 ft of an ore zone 5 mi long has been worked. Traver says the ore has been opened over a vertical distance of 250 ft with equally good ore at all depths.

Under the increased operation, about 25 tons of rock are milled daily with a yield of approximately one ton of concentrate monthly. The concentrates have been averaging about 65% tungsten oxide.

The Germania Consolidated lies 2 mi northeast of the famed Germania Mine, and is a 400-acre consolidation of the old Keith and Norton Mines with some additional ground. Traver and Ewing are testing old dumps at the mines to learn if they can be milled profitably.

Penticton Tungsten Mines Inc., a British Columbia company, started operations this summer at the old Germania tungsten mine in southwestern Stevens County, under a lease and purchase option from Tungsten Mining & Milling Co. of Spokane.

A new diesel power plant has been installed at the mill. Seven men were working on a 1-shift basis in June, when tungsten-bearing talus was being loaded by a power shovel operated by gasoline and then hauled to the concentrator.

It is estimated that 200,000 tons of the material will carry commercial amounts of tungsten. With each 8-hr shift, 100 tons can be treated and it is hoped that if sufficient water is available the company can work on a 2 or 3-shift basis. Frank Eichelberger, well known Spokane mining engineer, is general manager.

Waddington Mining Corp. Ltd., Vancouver, B.C., has taken an option to purchase an iron mine near Wenatchee from Washington Nickel Mining & Alloys Inc., of Seattle. Purchase price reportedly has been tentatively set at $4½-million.

Waddington is to have three years to investigate the property before making an initial payment of $500,000.

Silverton Mines Inc., Spokane, has leased Clugston Creek Mining Co's properties in Stevens County. The properties consist of more than 700 acres northeast of Colville and include the Chloride Queen.

Bulldozing along a vein of surface exposures of the Big Chief group of 11 claims was started in June. It was reported there that high grade lead-silver occurred over a 3-ft width.

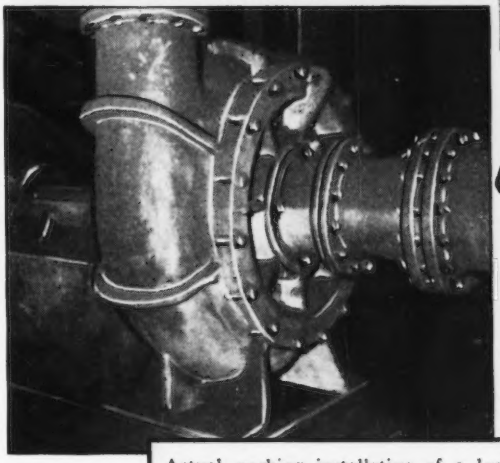
Expenditure of at least $10,000 yearly and work of 3-man shifts daily is provided in the lease.

IN CANADA

QUEBEC

A new possible base metals area has been the scene of much staking this summer,

Continuous Low-Wear Non-Clog Solids Pumping... At Lower Cost



Morris low-speed wide-clearance SOLIDS PUMP

Actual working installation of a low-speed, wide-clearance Morris Solids Pump which handles fine solids at a rate of 6,000 gpm at 52′ total head. Pump speed only 370 rpm, 14″ suction opening, 12″ discharge.

Where total heads do not exceed about 120 feet, low-speed, wide-clearance Morris Type-M Solids Pumps will handle solids ranging from fine abrasives up to pieces 11″ in diameter. The low-speed reduces the abrasive action of the smaller particles, the large clearance allows larger solids and "tramp" pieces to pass without trouble.

Longer Wear, Easier Maintenance

Designed so that the most important wearing parts receive the least wear, initial high mechanical and hydraulic efficiencies are maintained throughout the longer service period of the pump. Double-thick wearing parts are sub-divided and protected so that the greatest erosion is taken by easily replaced segments. That means speedy, easy renewal, less down-time and lower maintenance cost.

Free Consultation

Morris engineers are always available to discuss and study your pumping problems with you. Describe your needs in a letter—or call your nearest Morris office. Our recommendations are free—entail no obligation. Write for Bulletin 175 which describes the Type M Solids Pump in detail.

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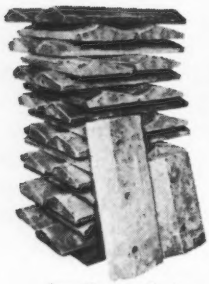
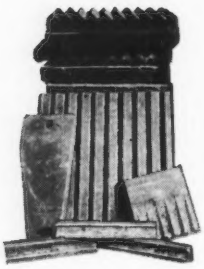


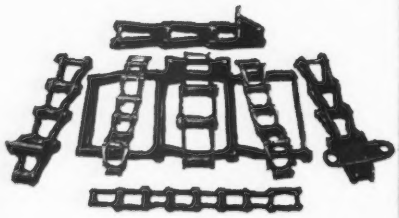
Jaw Crusher Parts

Dipper Teeth



Ball Mill Liners

3-piece Mantle for Crusher



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Quebec *(Continued)*

located 160 mi north of Senneterre in the watershed between Lake Evans and James Bay.

Major companies interested include Noranda Mines, McIntyre Porcupine Mines, Preston East Dome, Goldfields Uranium, and Mining Corporation. Main interest lies in Noranda's ground, on which a copper-gold showing is being investigated.

A promising gold prospect is under development by Eldrich Mines in Duprat Twp., west of Noranda.

Extensive surface drilling has indicated a large deposit, and work has been started on a 500-ft shaft. Average grade won't be known until underground work permits bulk sampling, as gold occurrence is irregular, but officials are confident that a profitable operation can be established.

Ore resembles that of the neighboring Elder mine, but grade is expected to exceed the $7-8 average that Elder shows. In addition, the deposit carries a high silica content, which makes it valuable to the Noranda smelter for fluxing purposes.

If the deposit stands up under development, first production will be achieved by shipping to Noranda at the rate of 400 tons per day. The new venture is being backed by Lamaque Gold Mines, Elder Mines, and Goldale Mines.

Start of construction on the Canadian National Railway's branch line to Chibougamau has sparked a new burst of prospecting activity in that area. More parties are reported in the field than in any of the past several years.

Among the leading companies are Noranda Mines, with an option on an 11-claim group at Opawica Lake owned by Siscoe Gold Mines since 1945; Belmont Mining & Exploration Co., with property in McKenzie Twp.; D'Aragon Mines, investigating a group staked last year in Chibougamau and with prospecting parties in search of new ground elsewhere; Louvicourt Goldfields Ltd., busy drilling a group of 109 claims in Cuvier Twp., 6 mi from Opemiska; Endeavor Mining Corp. and Lingside Copper Mines, both with well located ground in Levy Twp.; and many other organizations with men in the field at various points.

Encouraging indications have been obtained by Ungava Copper Corp. in first drilling at its claims near Bones Lake, not far from the southwest shore of Ungava Bay.

First three holes showed widths up to 120 ft with average grade between 1% and 2% copper plus values in zinc and nickel. The company will continue working all summer.

Lithium Corporation of America Inc., Minneapolis, and Quebec Lithium Corp., a subsidiary of Sullivan Consolidated Mines Ltd., have contracted for sale of spodumene concentrates from Quebec Lithium's deposit, 25 mi from Val d'Or.

Quebec Lithium announced plans to

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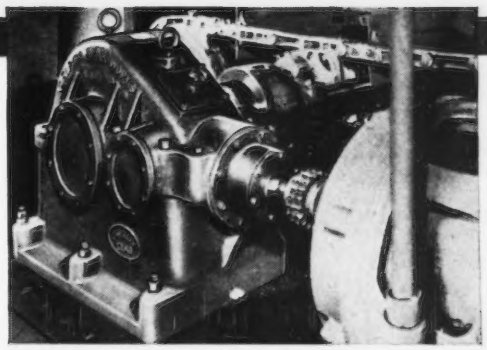

A Philadelphia Spiral Bevel-Helical Reducer driving a Flight Conveyor; 30 hp at 850 rpm; reduction ratio 10 to 1.

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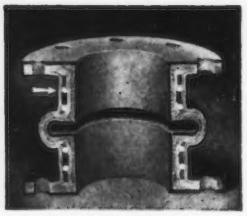

Sectional view shows sturdy construction of single arch joint. Arrow points to one of steel reinforcing rings

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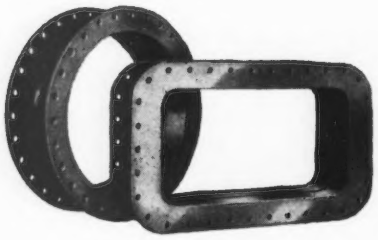

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Quebec *(Continued)*

begin construction immediately of a concentrator to treat about 1000 tons of ore a day. Completion is expected in about a year.

The United States firm will process the entire output of this concentrator at its two chemical plants at St. Louis Park, Minn., and Bessemer City, N. Car. Lithium Corporation last March announced plans to erect a $7-million plant at Bessemer City (*E&MJ*, April 1954, p 145).

Beattie-Duquesne Mines is considering a major program of depth exploration in which workings would be deepened 1000 ft below the present bottom 2000-ft horizon.

Geological and structural theory suggets the possibility of finding a repetition of the wide breccia-type orebody on which the mine was originally built, and the chances are considered favorable. If decision is made to go ahead, some $500,000 of new capital will be required. In the meantime the big low grade gold producer, veteran of the Duparquet area, continues to break a little better than even on present operations.

ONTARIO

Hollinger Consolidated Gold Mines has started a $350,000 construction program at its Ross mine in the Matheson area. In production with a 300-ton mill for many years, the Ross is not as widely known as the original big Hollinger mine at Timmins, but is nevertheless an important factor in the company's operations; production last year was $764,603 from 113,361 tons. Biggest single item in the new program will be construction of a new crushing plant at estimated cost of $320,000.

Ontario's lone asbestos mine, the Munro property of Canadian Johns-Manville Co. near Matheson, is going underground.

Following 4 yr of open pit production, it is expected that another 4 yr will see economic limits reached for surface mining, and it is anticipated that underground development can be completed in orderly fashion by that time.

Plans call for two shafts; a main production opening to 800 ft, with haulage tunnels located at the 740-ft level, and a 300-ft service shaft. Work on the underground mine will not interfere with open pit mining.

One of the biggest winze projects of recent years in Ontario is being undertaken by McIntyre Porcupine Mines. Although one of the oldest of the Porcupine gold producers, McIntyre thinks highly enough of its future to allocate $1.25-million for the job.

A 3-compartment internal shaft will be sunk from near the bottom of the No. 11 shaft, which drops from surface to 4150 ft, to serve the mine's many levels down to 6825 ft, the mine's deepest. These deep levels are now served by the No. 12 internal shaft, but additional hoisting capacity will be needed in a few

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"If that was all the TD-24 did, it would be worth its cost in the time it saves. But its real work comes when it pushes those heavy rocks away for new roads and when it is up on the spoil piles doing the work of two other tractors. We just plain couldn't do without a TD-24!"

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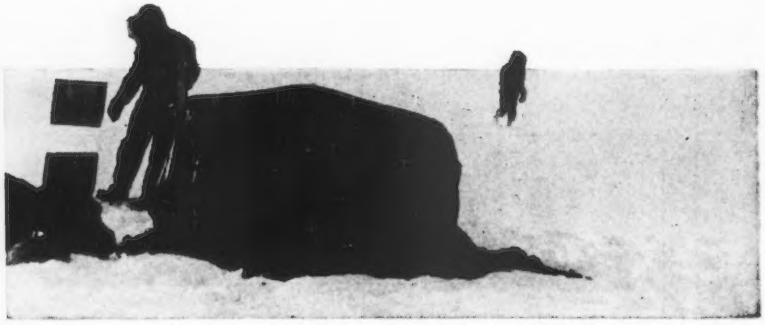

Ontario *(Continued)*

years as mining goes progressively deeper.

Ontario's first lead-zinc mine to be established in many years is now in production, Jardun Mines having reached that stage at its mine near Garden River in the Sault Ste. Marie area.

The plant, with rated capacity of 300 tons daily, is now handling 100 tons with heads running over 8% lead and 3% zinc, and the management expects that both tonnage and grade will be raised as the operation proceeds.

Monteagle Minerals Ltd. has been formed as a subsidiary by Ortona Gold Mines to develop its nepheline-corundum prospect in Eastern Ontario's Bancroft area.

It is estimated that known reserves are adequate to support a 500-ton operation for 18 years, with no limits yet reached in depth exploration. A 75-ton pilot plant will be built first to test and improve the flow-sheet and to introduce the products to the consumers. Metallurgical work to date has indicated that a recovery value of $12.77 per ton can be expected, the recovered minerals being nepheline, corundum, and white mica.

Jonsmith Mines, with property on the east rim of the Sudbury basin, is going into mining on its own account, and for that purpose has taken over the Milnet shaft and mining plant. First step will be to deepen the shaft from 500 ft to the 1000-ft horizon.

The company has been inactive for several years, having sold its known orebody to Milnet Mines; that company acquiring a block of ground 500 ft deep for the purpose of mining it, and Jonsmith retaining a 25% vendor interest. The Milnet operation, now concluded, has been a profitable venture (the ore was shipped direct to Falconbridge) and Jonsmith has more than $400,000 on hand.

Besides shaft deepening, plans call for extension of present Milnet workings into Jonsmith territory, and a program of surface drilling to test other known copper-nickel occurences.

Plans are being made for shaft sinking by Croft Uranium Mines, subsidiary of Macassa Mines in the Bancroft uranium area. Surface drilling and underground exploration by means of an adit has outlined a possible 500,000 tons to a depth of 500 ft. The shaft will probably go to that depth, at least.

One of the oldest prospects in the Kirkland Lake gold camp, long dormant, is to be given a new exploration test. Kirkland townsite Gold Mines, with property adjoining that of Wright-Hargreaves on the south, has made a deal with its neighbor under which the Townsite ground will be probed at depth from Wright-Hargreaves' lower levels. Terms of the agreement call for Wright-Hargreaves to do the work and to receive 75% of net profits.

British Ropeway Engineering Co. Ltd. announced in London, England, that it

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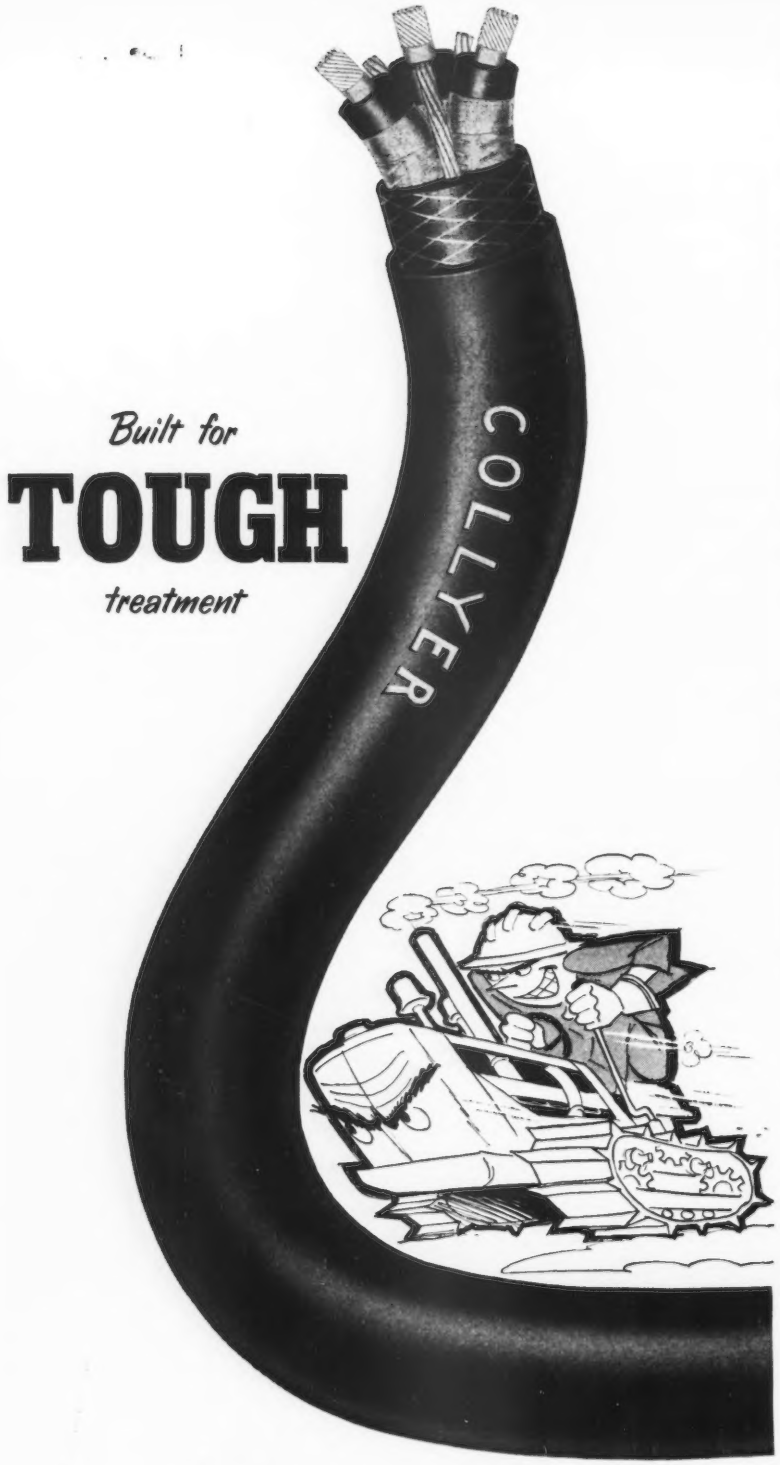

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Ontario *(Continued)*

has just received a $2-million order from Algoma Ore Properties, Ontario, for a mechanical handling and conveying plant.

The machinery is to be used to develop the large iron ore deposit at Helen Mine, Jamestown, Ontario.

Designed to carry 500 long tons an hour, the "ropeway" ordered is to be erected on a 2-mi surface area. It then is to enter a tunnel sloping downwards at 22 deg to a depth of more than 1500 ft where it will meet the orebody. The "ropeway" will advance by progressive stages and eventually is to dip an additional 2500 ft.

The "ropeway" will be continuous in action instead of intermittent as with normal vertical winding. It was pointed out that this mechanism is particularly useful in districts where weather conditions could impede or halt surface work.

Two new developments have sparked the MacLeod-Cockshutt situation: a new orebody at the company's Little Long Lac gold property, and a good looking uranium showing at a new property in the Capreol area.

The new gold orebody has been found on the mine's 8th level south of, and parallel to, the "F" zone which is now the mine's main revenue source. Flat drilling gives it a known length of at least 600 ft averaging 0.23 oz gold per ton across widths from 5 to 30 ft. The crosscut driven to it showed grade well above that average in the first 3 rounds.

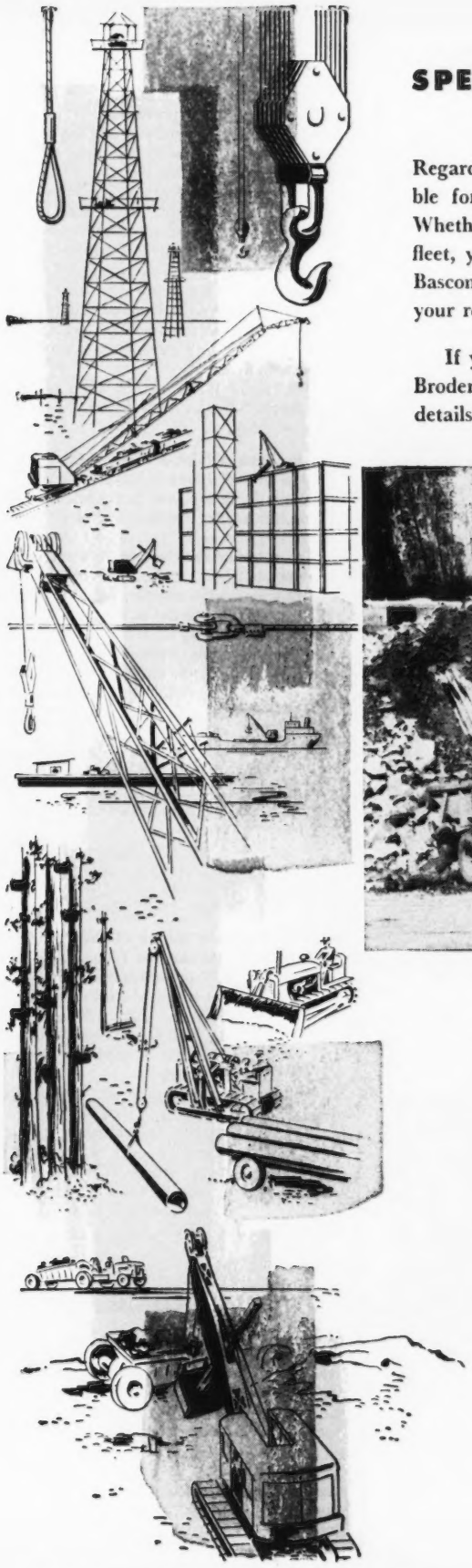
The uranium prospect, with conglomerate beds resembling those of Blind River, appears to be a big tonnage proposition. Diamond drilling already has been started.

Lateral work is underway on the 220-ft level at the Bancroft area property of Centre Lake Uranium Mines, following completion of shaft sinking. Work also is getting underway on the first level at 100 ft. It is expected that the work will be well into the ore by early fall.

Best looking discovery in the mine for years is reported by Cochenour Willans Gold Mines. A new orebody has been cut in drilling between the fourth and sixth levels by this long established Red Lake gold producer, with a length of more than 700 ft indicated.

More work will be needed to establish its potential, but the first few holes showed intersections considerably above mine average. (Best section was 7.8 ft averaging 1.9 oz gold cut.) The deposit, moreover, appears to be a type that will show regular dimensions and grade compared with the usual Cochenour ore which is too irregular for advance planning or estimates.

Silver output from the Gowganda area mine of Siscoe Metals of Ontario, subsidiary of Siscoe Gold Mines, approached 400,000 oz for the first six months of 1954, while cobalt output was just over 7000 lb.



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MANITOBA

Sherritt Gordon Mines Ltd. reports that initial results of its nickel-copper process are well up to expectations. The Lynn Lake mine is currently producing in excess of estimates with the mill capable of handling 2300 tons per day, 15% over rated capacity. Ore grade has been quite satisfactory, with the percentage of recovery above pre-production estimates.

The leaching plant at Fort Saskatchewan is operating on a small scale, one autoclave treating about 25 tons of concentrate per day. It is estimated that six weeks to two months will be required to fill the circuit and permit the production of nickel metal.

The ammonia plant has been making shipments of ammonia since the latter part of May.

North Rankin Nickel Mines Ltd. on the west shore of Hudson Bay, reports that high grade nickel ore has been opened up in initial development on the 200 ft level.

Car samples for the first 47 ft of drifting east of the crosscut averaged 5.62% nickel and 1.34% copper, while the first 47 ft of drifting to the west has averaged 7.62% nickel and 1.06% copper. The high grade zone showed a horizontal width of 60.5 ft where intersected in the crosscut from the shaft. Car samples averaged 4.67% nickel and 1% from this section.

A low grade zone showing a horizontal width of 38.5 ft and averaging 0.82% nickel and 0.23% copper is separated from the high grade zone by 30 ft of low values.

Crosscutting on the 300 ft level has intersected some shearing and mineralization but, so far, correlation with the first level has not been established.

The southeastern section of the Province is attracting attention as favorable prospecting ground for uranium. Considerable staking has taken place in the Rennie-West Hawk Lake area, 120 mi east of Winnipeg on No. 1 Highway, and in the Tooth Lake area, 40 air-miles northeast of Lac du Bonnet.

Uranium-bearing minerals occur in zones near porphyritic granodiorite and gneissic granodiorite. Indications are that systematic exploratory work will be carried out on several prospects in the Rennie area during the summer. One group of claims has been optioned by Graham-Bousquet Gold Mines Ltd.

BRITISH COLUMBIA

Canam Copper Co. Ltd., New Westminster, reports findings of copper ore in sufficient quantity to warrant construction of a large mill on its Hope-Princeton Highway property.

President E. L. Doyle states there is enough indicated ore for a mill of 2000 tons capacity and that the company is negotiating with major eastern Canadian interests to finance the operation. Latest assays of ore show an increase of 2%

or better in copper at the No. 10 level. Plans call for shipment of ore to Hope, B.C., and from there by barge to the Tacoma smelter.

British Columbia has prospects of a profitable new copper mine as a result of high values in copper discovered at Granduc Mines Ltd's property on the northern coast of the province.

L. T. Postle, vice-president and general manager of Granby Consolidated Mining, Smelting & Power Co Ltd., parent company of Granduc, reports that recent drilling revealed ore values ranging from 0.93 to 3.81% copper.

Postle cautioned that the entire season's work will have to be completed before the significance of the current drilling results can be evaluated, and that another year's work may be necessary before any decision relative to production can be taken.

A program to increase its mill capacity from 150 to 250 tons daily has been announced by Yale Lead & Zinc Mines Ltd. H. D. Forman, general manager, told shareholders at the company's recent annual meeting the program would cost around $140,800, and would require about 8 months to complete.

The expansion program includes about 2800 ft of crosscutting, 500 ft of drifting, moving crusher plant and installation of new crusher, installation of a second bar mill and addition of two cells to the lead circuit.

NORTHWEST TERRITORIES

Diamond drilling is now underway on American Yellowknife Mines Ltd.'s Beta uranium property in the Marian River area, according to a report by J. C. Byrne, president. Cores from the first two holes are expected to be available for assay before the spring breakup sets in.

Extensive surface development last summer and fall revealed parallel radioactive structures for a total length of 2365 ft.

Golden Slipper Mines Ltd., Vancouver, has acquired an option to purchase a group of 25 uranium-bearing claims near Vandyck Lake in the Northwest Territories. A careful examination will be undertaken this summer in preparation for an intensive development program, states President R. Crowe-Swords.

SASKATCHEWAN

Shareholders of Trojan Exploration Ltd. have approved purchasing the option of Western Projects Ltd., to buy 51 mineral claims in the Beaverlodge district of Saskatchewan and in the Yukon.

Recently, the company has had a crew working on its Chad group of 43 claims in the Beaverlodge area doing surface work and trenching in preparation for a scintillator survey of the property.

National Explorations Ltd. reports that a continuous length of 100 ft of ore in its Beaverlodge area mine has been revealed in drifting on the "C" orebody with both ends open in full faces of ore. At point of intersection the vein showed a true width of 7 ft averaging 0.80% uranium oxide.

Lorado Uranium Mines Ltd. announces sinking of a three-compartment shaft to start underground exploration of its Alco group on the southwest shore of Beaverlodge Lake.

A station will be cut at the 225-ft level and 1000 ft of lateral work will be carried out from that horizon. The company anticipated reaching the projected depth limit early in August.

Recent diamond drilling indicates an ore zone having a length of 910 ft and averaging 0.192% uranium oxide across 9.8 ft, Manager K. S. Oliver reports.

Eldorado Mining & Refining Ltd. reports sinking of the Verna shaft to develop the ore structure shared by Eldorado and the "Ace" group, leased from Radiore Uranium Mines Ltd., has been completed at a depth of 900 ft.

It is proposed to enlarge the capacity of the mill from 500 to 700 tons daily. The extra tonnage is being added mainly for convenience of customs shippers.

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Here is a high molybdenum silicon alloy steel drilling bit that will cut its way through the hardest formations faster, at less cost per foot, and with fewer dressings, than the conventional carbon steel bit used in ordinary drilling practice. The SPANG MOLLOY BIT is a *special* alloy bit, completely heat treated, with higher strength in the blade section and greater pin strength. Because of its deep penetrating hardness, it resists abrasion and battering under the severest drilling conditions. Its use is recommended where ordinary bits are ineffective.

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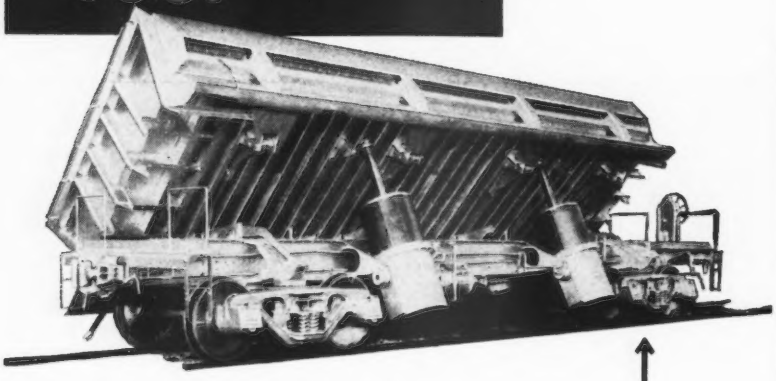

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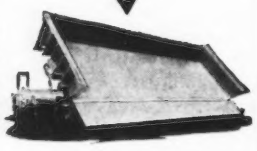

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SINCE 1915 — PIONEERS IN HAULAGE EQUIPMENT

NOVA SCOTIA

National Gypsum Co.'s estimated $6-million development of its new gypsum deposits will be ready for full-scale quarrying by the spring of 1955 according to Melvin H. Baker, chairman of the board. Construction of mine and dock facilities has already begun.

The Halifax property, which Baker says will provide a 200-yr supply for National Gypsum's four east coast plants, is part of company's $37-million expansion program, scheduled for completion by mid-1958.

Gypsum products plants in New York, Baltimore, Savannah and Portsmouth (N.H.) are also being expanded.

Ship loading and handling facilities now being built at Halifax will halve loading time at the firm's quarries and provide year-round, ice-free shipping.

IN LATIN AMERICA

MEXICO

Granting of a general 12% pay hike by 14 top mining companies is conceded to have averted threat of a general strike.

Some leaders of the 60,000-member mining union had demanded a 45% hike —the amount of the April 19th devaluation of the peso. The pay raise dates from May 15.

Employer spokesmen pointed out that President Adolfo Ruiz Cortines in a nationally-broadcast radio appeal May 14th had suggested that wages be increased only 10% to offset financial dislocations occasioned by the devaluation.

Companies involved include American Smelting & Refining Co., The Fresnillo, Cananea Consolidated Copper, Penoles, San Luis Mining and Mexico's top two iron-steel works: Fundidora de Fierro y Acero de Monterrey and Altos Hornos de Mexico.

Mining's renewed drive for tax relief is receiving support from Alberto Terrones Benitez, chairman, Senate Mining Commission.

In a speech of Senator Benitez presented at the 50th anniversary celebration of the Mexican Geological Society, the Senator declared that "present taxes on mining are unjust to a weak industry." He contended that the levies are disproportionate.

Senator Benitez criticized in particular the method of determining taxable profits of mining enterprises. He said the system ignores drilling and exploration costs. "Those costs must serve to give life and personality to every source of mining production," he observed.

The Senator advocated overhauling the mining taxation system, from computation to application, for "the good of Mexico as well as for the good of the industry."

Mexico *(Continued)*

Mine operators in Mexico have found little comfort from the recent devaluation of the Mexican peso some 40% from 8.65 to 1 to 12.50 to the dollar.

Ordinarily, devaluation of a currency is carried out precisely to encourage exports and as minerals are one of Mexico's prime exports, it would seem devaluation would be of great help.

However, the Mexican government choose to change the export tax on minerals from 15% in effect previous to devaluation to a combined export tax of 28% at the moment (there is a regular export tax and a supplementary tax). Other taxes on production saddle the mining producer with 38% total levy on value produced.

The mining people in Mexico have thus secured only a small transitory gain from the 40% devaluation and this is fast disappearing. Mine workers have already been granted a 12% increase across the board as a result of a presidential statement that federal employes were to get a 10% increase and he expected private industry to do likewise. Other costs are going up in the same proportion.

Constant representations are being made to the Mexican government by mining interests to gain some relief from the export taxes now in force. Both mining associations and individual operators have petitioned the government to remove the heavy export taxes.

The result of all this has been to curtail mineral production in Mexico at the moment. The world price situation can hardly be said to be a happy one and most small mines in Mexico remain closed.

Lead and zinc are Mexico's principal output and this market situation is well known. However, big operators such as American Smelting & Refining are carrying on with usual production.

Fluorite produced in Mexico can hardly be given away, according to men in this field, while tungsten is in the same situation and maganese also is hard to move except of the highest grade.

As one mining expert in Mexico noted, "production in Mexico would be booming *if* world prices were up despite the export tax." It is really more the bad market situation that is curtailing production in Mexico than the export tax. But the export tax doesn't help, it is admitted.

There is some hope the Mexican government will partially lift the export tax before the end of the year. It has already done so in the case of some non-mineral products such as cotton. It would appear inevitable that it will follow suit for minerals.

Dolores Mine at Angangueo, Michocan, shut down after a fire last year, reportedly will be reopened.

A new Mexican company, Impulsora Minera de Angangueo, will operate the silver-lead-zinc property. The new firm is headed by David Contreras Castro, a mining engineer and university professor.

On April 25, 1953, 25 workmen lost their lives in a fire at the Dolores Mine. At that time the mine was being operated by American Smelting & Refining Co. After the fire, Asarco termed the remining ore as only of minor value and cancelled its lease. The mine is owned by the Michoacan Railway & mining Corp.

CHILE

Chile has lost second place as a world copper producer to Northern Rhodesia, according to British metal statistics.

Figures for 1953 were: United States 826,000 tons; Northern Rhodesia, 367,000 tons and Chile, 350,000.

This is the first year that Chile has been displaced by Northern Rhodesia as a copper producer. If her small and medium size mines are taken into consideration, this country produced in 1944, 498,520 metric tons of fine copper which has remained a record production.

Since that year, output of copper has been decreasing steadily. In January of this year production was down to 30,490 metric tons and in February 28,845 metric tons. In 1952, when production of copper was 404,739 metric tons of fine metal, the copper industry contrib-

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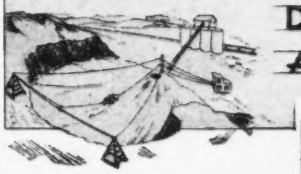

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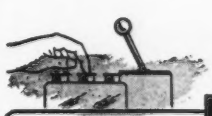

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ONE-MAN MATERIALS HANDLING

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Chile *(Continued)*

uted $209-million to Chile's foreign exchange out of a total $470-million. The copper industry employs at the present time about 13,000 workers who receive the highest wages in Chile.

Chile Exploration Co. is producing now at the rate of 32-million lb per month of blister and electrolytic copper.

C. M. Brinckerhoff, general manager, said in a press interview at Santiago that the sulphide plant is producing 7500 tons per month of blister copper. Brinckerhoff mentioned also that the mine is now working six days per week as agreed with the government; that there had been a steadier demand for copper, both from the U. S. and from Europe and that Chuqui does not hold any substantial stock of copper at the present time.

He pointed out that there had been a greater demand for electrolytic copper and added that the company will make every effort to increase the production of this class of copper in order to satisfy the increased demand. He opined that the output of electrolytic copper at Chuqui can be increased eventually between 40-and 50%, which would enable the mine to deliver 10,000 metric tons of electrolytic copper per month.

Coming to the question of costs, Brinckerhoff made a reference to the fact that the company is still obtaining a rate of exchange of 19.37 instead of 110 pesos to the dollar, which difference increases costs very appreciably. He said that when Congress gives American companies an exchange of 110 pesos to the dollar, this fact alone will enable the company to reduce costs by 4.5c a lb.

The interview ended by Brinckerhoff expressing his opinion that construction of an electrolytic refinery to refine the blister from the smelter would not be justified under present conditions.

Three small plants are now beneficiating tailings from the Potrerillos mill of Andes Copper Mining Co. These tailings from the flotation mill go all the way to the sea from Potrerillos and in so doing fall some 7500 ft.

The cascading and scouring action in the fall to the sea seems to make some of the copper minerals float in any of the three mentioned retreatment mills, though they will not float in the large mill. None of the mills rehandling the tailings use any fresh reagents, only those that the tailings bring with them.

Last year Chile produced 2,903,000 tons of iron ore, running 60% metallic iron.

All this ore was obtained from El Tofo Mine in Coquimbo Province which is being exploited by Bethlehem Chile Iron Mines. The same company is preparing for exploitation another iron mine known as Romeral, which has some 20-million tons of iron ore of 60% grade, and which will replace El Tofo when this mine is worked out within 3 or 4 years.

Original tonnage of El Tofo Mine was 45-million tons, but since 1948 the mine has been exploited at an annual rate of almost 3-million tons. Value of these ores has been around $10.5-million yearly.

Mauricio Hochschild & Co. has been drilling the well-known Mantos Blancos copper deposit, 30 mi east of the port of Antofagasta.

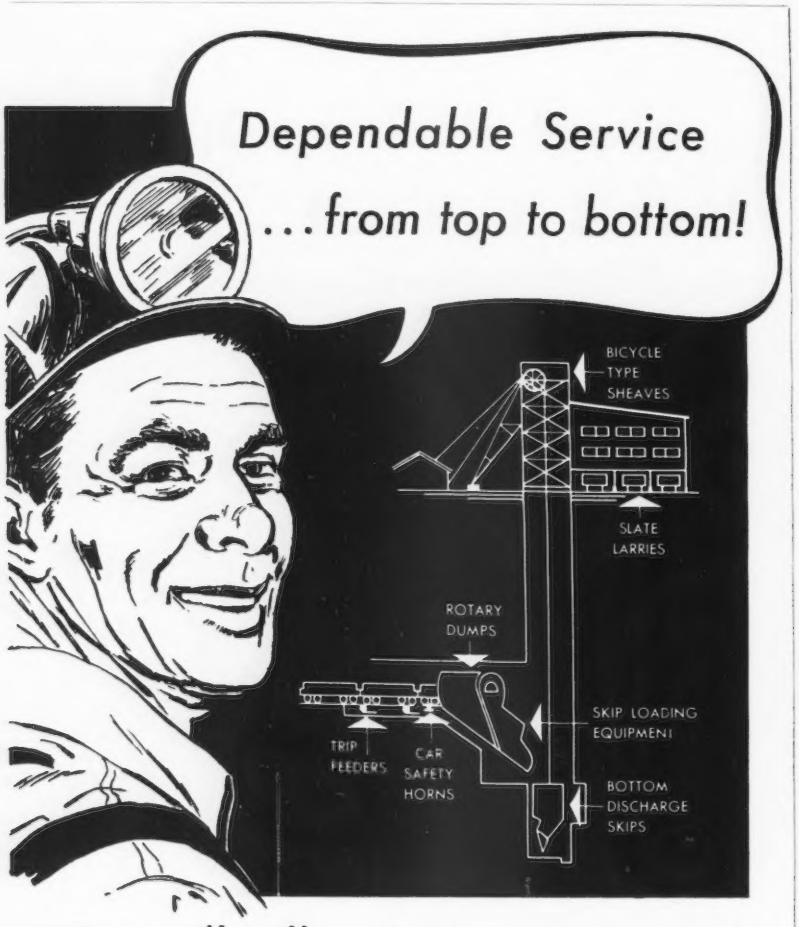
Though the Mantos Blancos deposit has been selectively mined in the past, when the price of copper has been sufficiently high, it never had been drilled systematically.

For the sixth consecutive year, Braden Copper Co. received the Interamerican Safety Award given by the Interamerican Security Council yearly to the mine in Latin America having the lowest accident rate.

The Braden index for 1953 was 5.69, which represents an improvement of 31.4% over 1952. Braden also had completed 489 consecutive days without a fatal accident, during which 23,414,000 man-hours were worked.

COLOMBIA

Colombia's gold mining industry again is facing a serious crisis.



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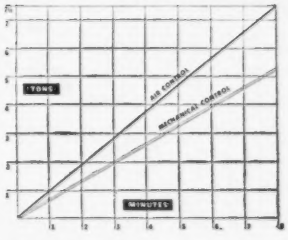

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Colombia *(Continued)*

Since the government suspended the 30-peso per oz subsidy in June 1953 and established the free dollar for gold exports, things went relatively well because this dollar sold at 3.15 pesos. But with the coffee bonanza, free dollars went down to between 2.75 and 2.80 so that the mining industry had again to tighten its belt.

This still is being done by limiting exploitation to the more productive part of the deposits. Where some years ago a company had counted on 20 years exploitation and brought in the necessary dredges and machinery, they have now to reduce to an exploitation period of six or fewer years leaving unexploited the less productive part of the concession.

It is now planned that the government will aid small mines with a subsidy of 20 pesos per oz.

The three big mining companies, the British Frontino Mines; the Canadian Pato Gold Dredging and the U.S. Compañía Minera Chocó-Pacífico state that this discrimination against the big companies that produce 75-80% of the gold is unjustified. They will go on producing gold, of course, but they will reduce their field of action as described above and will thus leave part of the national wealth unexploited.

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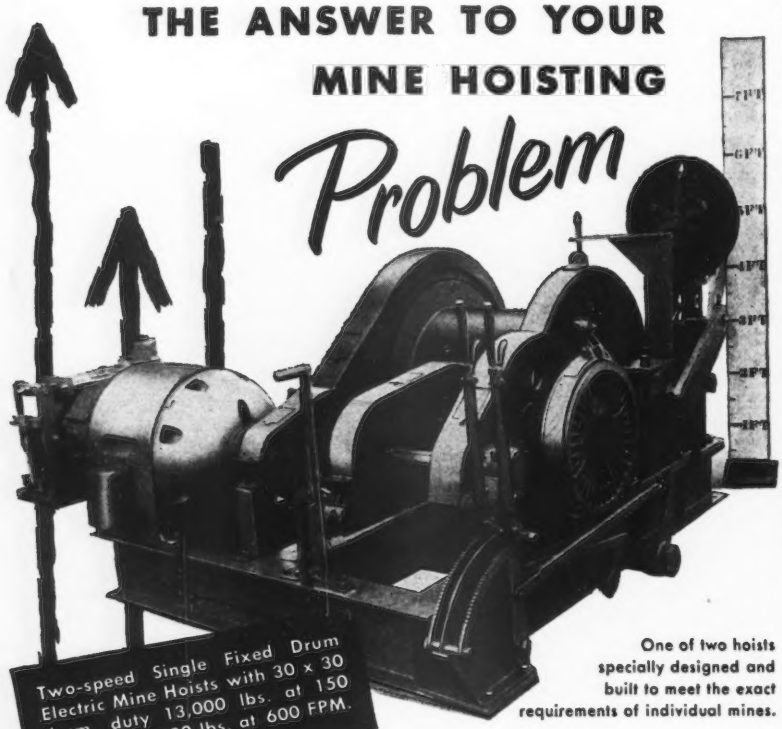

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BOLIVIA

Juan Lechin, Bolivian labor leader and Minister of Mines, was to leave La Paz July 16 to visit Germany and Belgium. Usually well-informed sources believe that his visit is in connection with possible purchases of furnaces for a tin smelter.

Minister Lechin was to be accompanied by a Senor Biggmann, manager, Bolivian Mining Corp. For some time, Bolivia has been studying the possibility of erecting its own tin smelter. Bolivia now sends its low-grade tin concentrate, about half its production, to the Texas City Tin Smelter; the remaining half, the high-grade concentrate, to England for smelting.

A German mission visited Bolivia to study the question early this year. The mission included engineers of Lurgi Chemical Manufacturing Co. and of Friedrich Krupp AG of Essen.

CUBA

Plans for a $2.5-million plant to purify and convert manganese were announced in Havana. The plant will be designed to process about 600,000 tons of low-grade manganese ore and will employ 1000 workers.

Firm involved is Compania de Manganeso Oriental Americana, a subsidiary of Pan American Minerals Inc., located at Conuco, Manzanillo, Oriente. An engineer, Frank Trotter, was said to be head of the new firm.

Pan American Minerals Inc. is the firm which worked the mines of El Cristo, Oriente, from 1931 to 1946.

BRITISH GUIANA

Two large iron ore deposits, totaling nearly half a million tons, have been discovered in British Guiana, according to a geological survey department report.

The report, released in Georgetown, adds that it is up to the larger mining companies to decide whether the grade of ore found could justify large-scale economic exploitation at present.

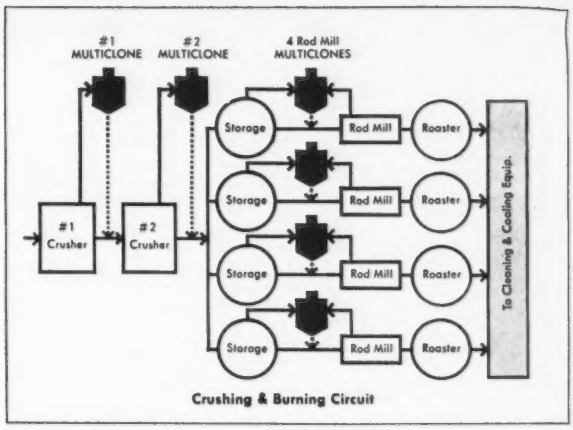
IN AFRICA

Estimates of gold mining operations in the Transvaal and Orange Free State indicate that output will exceed 12-million oz this year—the first time since 1943.

This was stated by Kenneth Richardson, president, Transvaal and Orange Free State Chamber of Mines, at the annual general meeting of the Chamber in Johannesburg.

Richardson said that the main causes of increased output were considerable

6 MULTICLONE
DUST COLLECTORS



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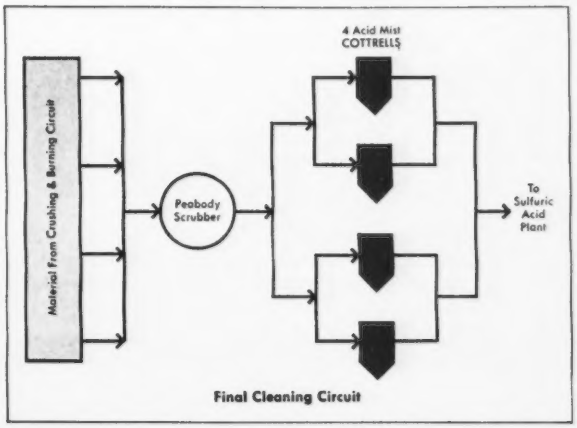
These Cottrells are the newest Western Precipitation acid mist design



Final Cleaning Circuit

Anaconda selected six Western Precipitation MULTICLONES *and four Western Precipitation* COTTRELL *Electrical Precipitators to handle key recovery operations at its new $30,000,000 Yerington installation.*

THE 6 MULTICLONES are installed in the sulfur crushing plant where sulfur ore is crushed and ground for use in the Roaster operations. Since this crushing and grinding develops a considerable dust problem, the primary crusher (a jaw type), the secondary crusher (a cone type), and each of the 4 rod mills has an individual 9VG Multiclone Mechanical Collector installed for recovering suspensions from the exhaust gases.

So efficient are these Multiclones that the exhaust gases are practically free of all visually discernible dust!

Inasmuch as each crusher and mill has its own Multiclone unit, maximum flexibility in plant operation is achieved—with greatly simplified duct and dampering requirements. Savings in plant maintenance are also obtained by having the Multiclones ahead of the fans so that abrasive dusts are removed and only the clean gas reaches the fan equipment.

THE 4 COTTRELLS are installed in the acid plant process to electrically precipitate the acid and water mist from the SO_2 gas generated in the Fluosolid Roasters. From the Cottrells the gas passes directly into the contact acid plant where it is converted into sulfuric acid.

The four Cottrells have 100 pipes each, and are designed for a capacity of 33,900 cfm at 110°F. with a negative pressure of 30″ w.g. and a recovery efficiency of 99.0%!

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The Weed-Heights installation is one more example of the flexibility and adaptability of Western Precipitation recovery equipment to varying operating requirements. Remember — Western Precipitation designs, engineers and installs BOTH *electrical* (Cottrell) and *mechanical* (Multiclone) recovery systems — therefore can give an unbiased recommendation on the type best suited to your particular requirements. A wire, letter or phone call to our nearest office places this unmatched "know-how" at your service!

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Africa *(Continued)*

additional native labor and the coming into production of new mines with ore grades considerably higher than the average for the industry generally.

Working costs were continuing to rise and, as a result, profits for the first five months of the current year were £603,000 less than in the corresponding period last year.

Full production of uranium had not yet been reached, but for the first three months of this year five out of a total of 23 uranium producing mines had shown a profit of £1,376,845.

Editors Note: South African gold production for 1953 amounted to 11,940,000 oz. This figure covers the Transvaal and OFS, which represent practically the total output of the Union of South Africa. World production of all countries reporting (Russia and other Iron Curtain nations not included) amounted in 1953 to 21,836,000 oz.

Value of gold production reached a new peak in May: $38-million—compared with the previous record about $37-million for March this year.

Gold output for the Transvaal (with April figures in parentheses) was 976,218 oz. (948,679 oz) and for the Free State 71,465 oz (66,808). Average grade in the Free State was 4.509 dwt per ton milled; in the Transvaal 3.931 dwts per ton milled.

Milling reached 5,284,000 tons due primarily to the continuing increase in the native labor force which reached a total of 313,070 workers—the highest level since March 1950. Rationalization of labor utilization and increased mechanization also contributed to the higher milling result.

Working costs in the Transvaal were $5.21 per ton milled; in the Free State $7.85. The reason for the huge difference is that most of the Free State mines still are developing.

Totals for the first five months of this year are: 25,028,700 tons milled; 5,008,502 oz produced; working revenue $174,787,054; working costs $134,597,335.

Coal shortage caused the Mufilira copper mine in Northern Rhodesia to suspend operations for several days. The N. R. Copperbelt depends on the Wankie Colliery in Southern Rhodesia for its coal supplies which had been delayed because of a rail strike.

Within about three months the Canadian Overseas Asbestos Corp. hopes to establish in Southern Rhodesia a plant capable of absorbing the entire output of the small Rhodesian asbestos workings. All asbestos bought by the corporation would be sent to India.

Holland interests have acquired the Kamativi tin mine in Southern Rhodesia. By the end of 1954, some $2.5-million will have been spent in development work, according to announced plans.

Unkondo Copper Mine, in Sabi Valley, Southern Rhodesia, closed for 30 years, is being developed by the Messina De-

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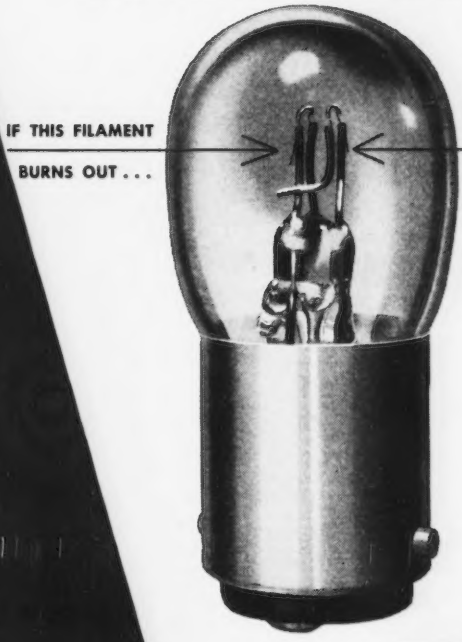

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Africa *(Continued)*

velopment Co. An official said that the mine would start production early next year.

US Foreign Operations Administration has granted the French Government a loan of 500-million francs to finance a public works program in connection with a new copper mining project at Akhoujt in Mauritania, according to the French Ministry for Finance and Economic Affairs.

The copper deposits are to be mined by the Societe des Mines de Cuivre de Mauritanie.

MOROCCO

Largest producer of manganese ore in the French Union, the Societe Cherifienne d'Etude Minieres, announced that it shipped 206,000 metric tons from its mines in 1953 against 172,000 tons in 1952. Production and shipments in 1954 are expected to maintain 1953 levels.

FRENCH NORTH AFRICA

New plans are under consideration to solve the transport problems of the rich iron ore deposits in Mauritania. The Moroccan Public Works department has assigned the hydrographic ship Admiral Mouchez to study the question of where to build a port on the Atlantic coast to exacuate the iron ore of the Tindouf region.

Tindouf, the scene of Beau Geste stories of the French Foreign Legion of the 1920's is now the location of an estimated 100-million tons of high grade iron ore. When the transport problems are solved, an annual production of $4-million tons is anticipated. Construction of a 200-mi railroad awaits determination of a suitable place to build a port. Under consideration are the mouths of the rivers Noun and Draa, about 180 and 200 mi south of the port of Agadir.

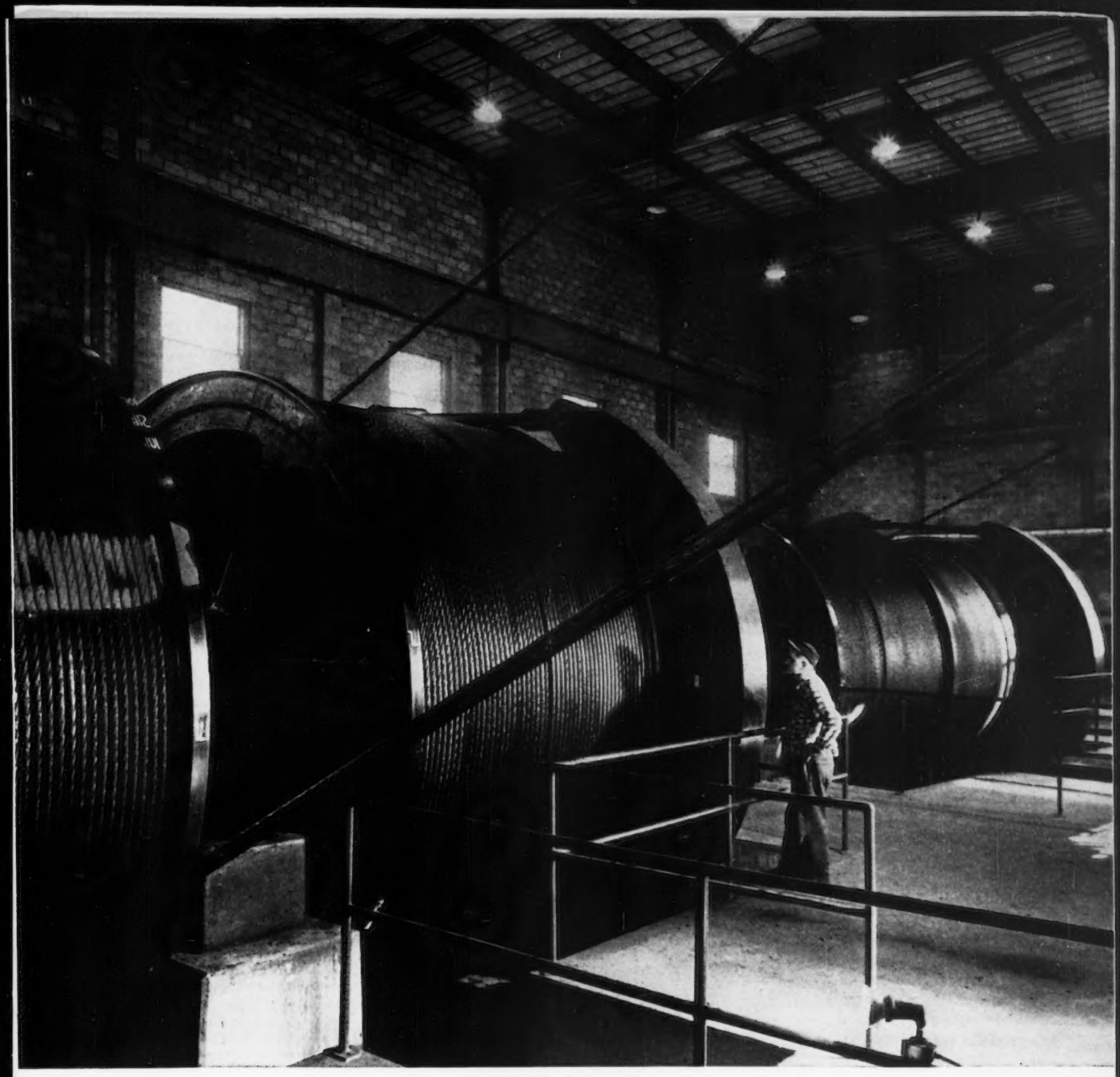
Participating in the exploitation of this deposit will be the Canadian Frobisher group, the British Iron & Steel Corp. and the French Mokta El Hadid. The combination will operate as the Societe des Mines de Fer de Mauritanie.

MADAGASCAR

Discovery of high grade uranium and thorium in southwestern Madagascar has been announced. The discovery was made in the summer of 1953 by the French Atomic Energy Commission working with the geological service of Madagascar.

The deposits at Behara-Esire are 60 mi north of Fort Dauphin and cover an area 50 mi long by 12 mi wide. Ore consists of oxide of thorium mixed with oxide of uranium.

While the exact uranium content is still a secret it has been revealed that it is higher than most other deposits.



Wire Rope at Work—In northern New Jersey is the Mt. Hope iron mine of the Warren Foundry & Pipe Corporation. It is a model of good housekeeping and mining efficiency, as this view of the hoist house indicates. The hoisting apparatus consists of two separate installations, one of which operates the balanced ore skips, the other a man-and-materials cage.

Depth of the shaft is 2750 ft, and levels are at 1700, 2100, and 2500 ft. The skip travels at 1800 ft per min; the cage, 800 ft per min with personnel, 1200 when carrying material. The handling of the heavy loads is entrusted to Bethlehem wire rope, Purple Strand grade, and almost three miles of this sturdy rope is used on the two hoists. Here Purple Strand is doing its usual reliable job, meeting every demand of the rigorous service with plenty to spare.

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Madagascar *(Continued)*

Some idea of the value of the ore can be measured by the fact that the French Atomic Energy Commission, the sole legal buyer, reportedly will pay about $1.25 a lb for the ore.

Madagascar already has under exploitation other deposits of uranium ores near Antsirabe.

GOLD COAST

Gold Coast government diamond market opened for business July 12. A license has been issued to the Gold Coast African Diamond Co. Ltd. Diamond winners now are able to sell on this market directly to licensed firms.

IN AUSTRALIA

Two important uranium discoveries have been announced by South Australian authorities, and Aussies are jubilant at the economic implications of these discoveries.

A new, vast area rich in uranium ore has been discovered in northeast South Australia and a simple ore treatment process has been evolved which will save the local uranium industry several million pounds and may enable economic exploitation of otherwise uneconomic deposits of ore.

The new vast uranium area is 75 mi northwest of the well-known uranium deposits at Radium Hill. Experimental drilling of an extensive nature was arranged for in the last few months and has disclosed a field, spread over an area of some 500 sq mi, with promise of many millions of tons of uranium ore. The new discoveries are in predominantly rocky country and comprise dozens of outcrops of radioactive minerals.

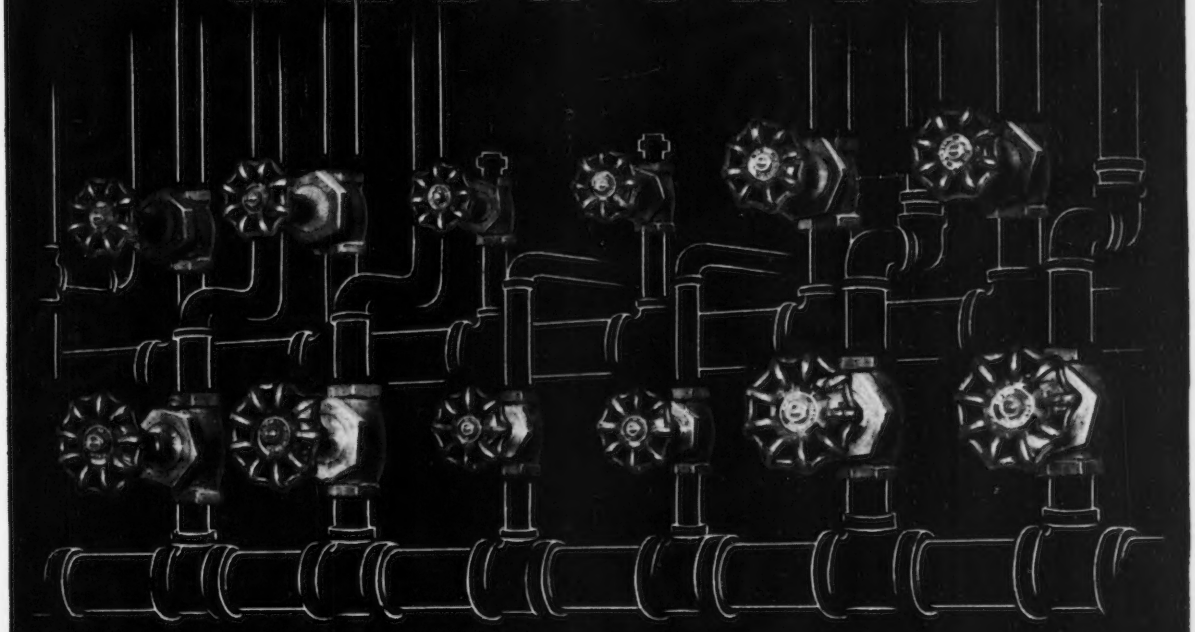
First find was made at Crocker's Well, where considerable quantities of ore have been located. Recent prospecting over a radius of 25 mi from Crockers Well was so successful that in the words of one geologist "the latest map of the area is covered with a rash of little dots and squares representing new radioactive outcrops".

It is understood that the most promising of these is Mount Victoria on Glenorchie Station. Ore in the newly located uranium area is very similar to Radium Hill ore. Present plans provide for the use of this area as a supplementary source of supply to Radium Hill. Well informed experts are of the opinion that further discoveries may yet make the new area at least as important as Radium Hill.

The new uranium ore treatment process was the result of over 18 months research in the South Australian Mines Department's research group plant at Adelaide. The process appears to be very simple and will be known as sink-float system.

Its application will initially reduce the cost of the Port Pirie, South Australia,

WALWORTH



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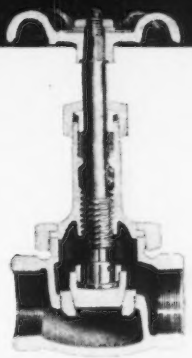

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Australia *(Continued)*

treatment plant by up to 80% (previous estimates for the cost of the plant were in the vicinity of $17-million). Instead of the ore being railed from Radium Hill to Port Pirie for treatment, only one-fifth—the most concentrated part of it—now will leave the field.

Ore will be crushed into 1-in. pieces and dropped into a large tank containing a semi-liquid mixture. Pieces containing a high percentage of uranium ore will sink and then will be transported for treatment to Port Pirie.

Senior officers of the South Australian Mines Dept. said that the Radium Hill field would have been uneconomical without this process. It is not yet known whether the same process could be applied to uranium ores of different origin.

End of wet season in the outlying districts is marking the resumption of several intensive prospecting campaigns for uranium.

Big efforts are being planned by several private companies and the Federal and State Governments will provide some scientific assistance. In the meantime, unofficial but highly reliable Canberra sources reported that Australia expects to produce more than twice as much uranium yearly from the Rum Jungle field than previously expected. These big increases are due to additional discoveries and to the fact that the Rum Jungle field contains an orebody more extensive and richer than at first thought. An adjusted program of mining expansion is being prepared.

Technical and financial variations in the agreement previously concluded between Australia and the British and American authorities will be announced in the near future.

It is understood that American purchasers are prepared to buy greater quantities of uranium from Australia but Australian Federal Government is not planning for greater sales.

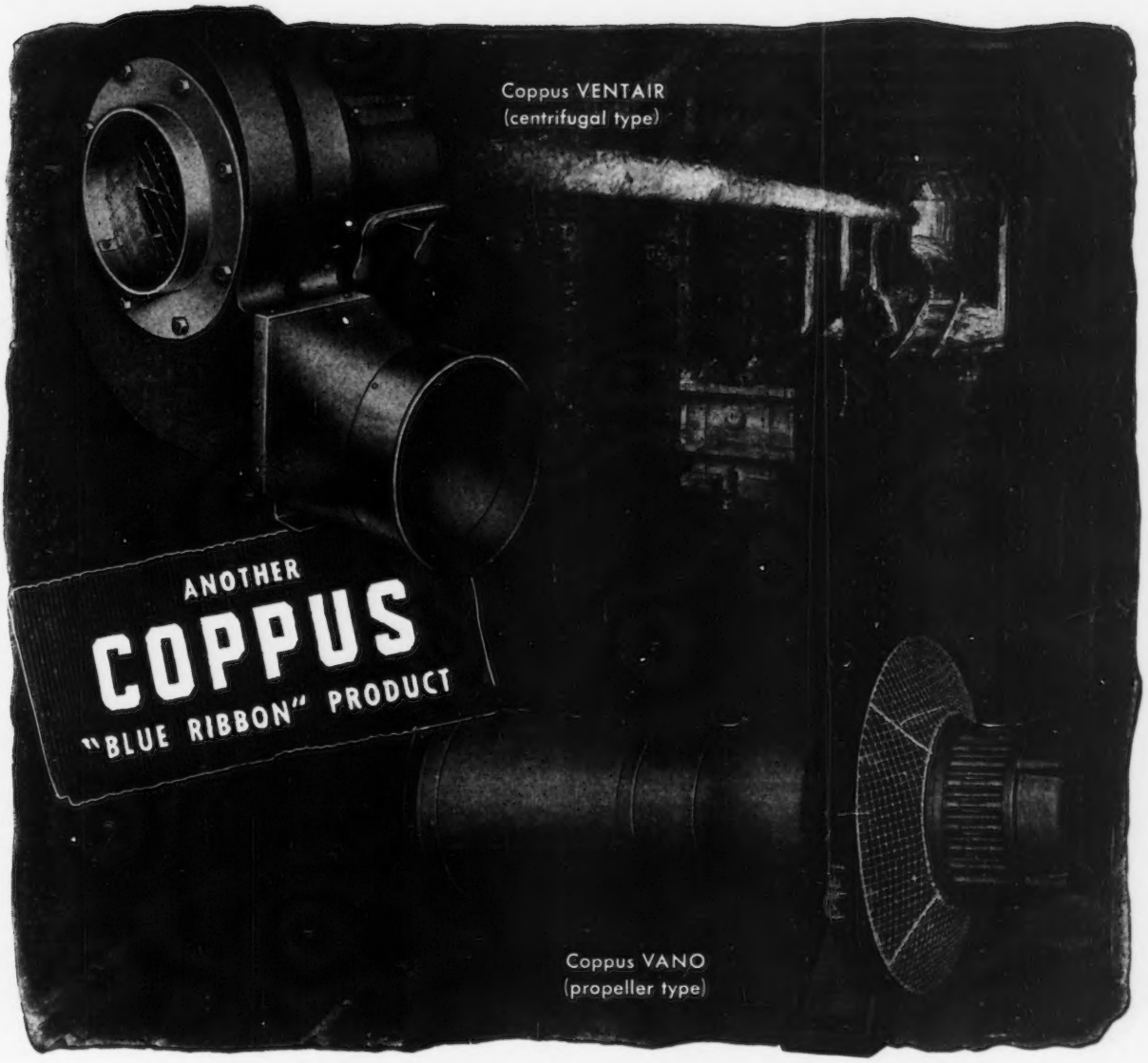
An extensive Commonwealth sponsored atomic research program is planned for Australia under the auspices of the Australian Atomic Energy Commission. Part of the Rum Jungle product will be used in the construction of Australia's first atomic pile.

Latest reports claimed that by August or September, the Rum Jungle plant may start producing uranium oxide for shipment to America for the Combined Development Agency.

Reports from New Zealand say that a nationwide search for uranium will be shortly arranged under the auspices of the New Zealand Department for Scientific & Industrial Research. The campaign may last up to three years. Private prospectors will be encouraged and assisted.

Back in Australia, Uranium Development & Prospecting N. L. has started breaking ore from the enriched zone in the Adelaide River area for the Rum Jungle treatment plant.

Roads are built for the transportation of the ore. An assay of leached material has shown 13% uranium oxide. An ore sample from the south of the company's



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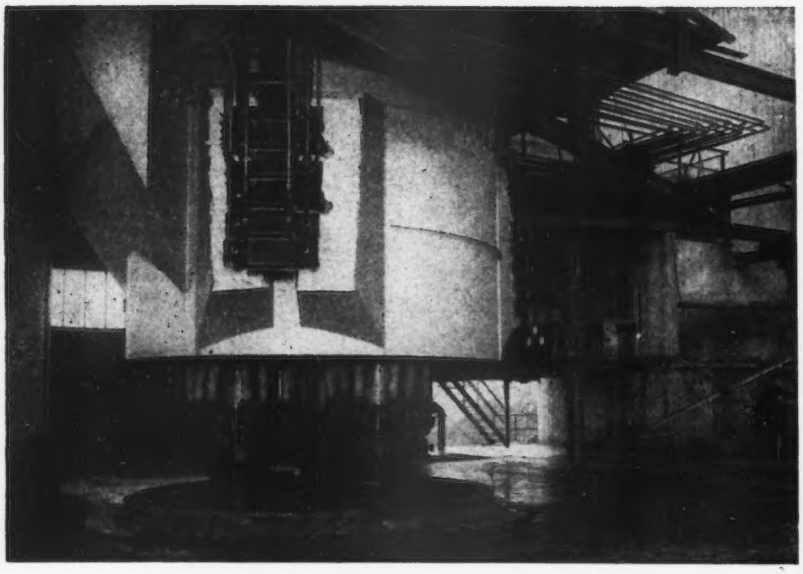

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Australia *(Continued)*

No. 1 costean on the Adelaide River area shows an altered primary uranium material—pitchblende—which shows the presence of a pitchblende lode at depth.

Peko Gold Mines N.L. has completed its copper ore plant to the 50 tons a day stage and work is proceeding on the extension of the plant's capacity to 100 tons a day. Work on the gold plant is also in progress.

The west drive on the 200-ft level was advanced, revealing copper ore of high value carrying considerable native copper and cuprite. This ore is additional to previously indicated reserves. An average assay in another place gave values of 9.1. dwt of gold and 18.7% copper.

Lake George lead and zinc mine at Captain's Flat, New South Wales (third biggest in Australia), is deepening a shaft in an urgent move to provide sufficient zinc and lead ore to keep the mills producing.

Full production of rutile is expected before the end of 1954 by Associated Minerals Consolidated Ltd. Recovery of beach sand minerals so far has confirmed results of test borings.

Western Australian Uranium N. L. has extended its No. 1 trench to 915 ft revealing a section of concentrated mineralization which according to W. A. Uranium N. L. has already been identified as uranium. The trench would be deepened and the mineralization explored.

Meanwhile, No. 11 trench had been started and equipment was received to enable trenching to a greater depth.

Territory Uranium Syndicate reports that the vertical shaft is down more than 55 ft with torbenite and uranium ochres in hard black silicified slate. Additional equipment is being installed.

A new uranium prospecting company, Northern Uranium Development N. L., was formed to develop two areas, one in the Waggaman Gold Field near Rum Jungle, and another in the Herberton area of Queensland. A Queensland Government report says that torbernite has been identified in the Herberton area.

New South Wales output figures for 1953 show very high levels of production in the silver-lead-zinc industry where, compared with 1952, increases were recorded for lead (26.6%), silver (18.7%) and zinc (29.1%).

A considerable amount of copper was also recovered, increasing N. S. W. output of copper by 4%. Production of tungsten rose by 62%, mainly due to operations at Boorowa in the second half of 1953.

The closure of the Cobar gold mine was reflected in output figures which dropped by 31% and further decreases are now expected. Tin and rutile output figures have also reflected lower prices and demand for these products.

Value of Australian gold production in 1953 was the highest since 1939. Output

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Australia *(Continued)*

was 1,052,779 fine oz, which meant an increase of 7½% over previous year's figures but it was still 35% below pre-war figures.

Western Australia produced by far the biggest amount, namely 823,331 fine oz. Second biggest quantity came from Queensland and totaled only 91,477 fine oz.

Of the total gold quantity exported in 1952/53 which was 1,250,162 fine oz, the exports to the United Kingdom accounted for 718,294 fine oz followed by exports to France totalling 361,567 fine oz.

Morning Star Mines N. L. reports assay values averaging 5 oz 10.4 dwt a ton over 6 ft for the first 15 ft of the 1500 N. winze from No. 16 level.

IN THE PHILIPPINES

Atlas Consolidated Mining & Development Corp. is rushing to completion the foundations of buildings to house 4000-ton mill at the Toledo copper mine in midwestern Cebu. The mill is scheduled to crush its first feed of ore in October or November.

The Toledo copper mine is expected to become the largest property operating on low-value copper ore in the Far East. Its annual production potential is estimated at 30-million lb of copper in addition to a small amount of molybdenite and some gold. Pyrites production will be 260 tons a day.

Since exploration and development work started in 1952, ore reserves totaling 20-million tons have been blocked out. They were reported to contain an average of 1.13% copper and 0.015 oz of gold per ton. At the current market price for copper in foreign markets and the free market price for gold, annual production is estimated worth $9-million for copper and $600,000 for gold.

Seventeen kilometers by road from the mine and mill, a 500-ft wooden pier is nearing completion. It is extending into deep water at the end of a 500-ft rock-filled causeway.

The Atlas mill will use steam power generated with coal rather than fuel oil.

Atlas Consolidated was incorporated recently with an authorized capital stock of $7.5-million of which $4,150,000 have been issued.

IN EUROPE

AUSTRIA

Austria plans to leave the ranks of international zinc buyers when the first

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Austrian zinc mill goes into production in the summer of 1955.

Laid out for an annual production capacity of 10,000 metric tons of pure zinc, the mill, located at Gailitz (Carinthia Province), will increase the business activities of the Bleiberger Bergwerks Union, one of Austria's nationalized mining enterprises.

So far, Austrian zinc ore has been sent to Holland, Belgium, or West Germany, where the nearest processing plant is located. From there, the refined zinc was imported to serve Austrian consumers.

Austrian output in 1953 of 1,320,705 metric tons of raw iron was 12.6% greater than that of 1952. Raw steel output in 1953 amounted to 1,283,303 metric tons, 21.4% greater than that of 1952.

These statistics were given by Dr. Ing. Josef Oberegger, director-general, Alpine Montan A. G., who spoke before a meeting held recently in observance of the annual Austrian Iron Mill Day.

Success of Austria's iron and steel industry in 1953 was ascribed to gains in iron ore mining. In 1953, some 2,744,500 metric tons of iron ore mined reflected an increase of 3.96% over the 1952 total of 2,652,000 metric tons.

Styria's Erzberg (see *E&MJ*, December 1953, p 125) alone yielded 2,390,000 metric tons. Yield per workday rose from 1952's 7598 metric tons to 7888 for 1953.

A fine ore wet-processing plant installed in 1952, which uses heavy liquids, processed 2-million metric tons of raw ore. By mid-1955, a second plant of 2-million tons annual capacity will be in operation.

ENGLAND

Plans for construction of a $56-million steel works at Ravencraig, near Motherwell, Lanarkshire, were announced July 8th by Colvilles Limited, Glasgow. Work is to begin this summer.

The project will be the biggest single industrial unit in Scotland for many years. Some 600,000 tons of iron ore will be needed annually. New ore-handling facilities are to be provided on the river Clyde at Glasgow.

POLAND

Poland's first aluminum plant soon will begin operation. Basic construction has been completed at the Metallurgical Works of Skawina near Krakow. Officials claim that it will be Europe's most modern plant.

EAST GERMANY

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East Germany *(Continued)*

near Aue, Saxony, where two reactors will consume about 12 metric tons of uranium per year.

This installation is to become a supranational project, according to invitations sent to all East-bloc governments to participate in the venture, which is planned and under the management of a leading German atom scientist who was captured in 1945 by the Red Army.

From the Joachimsthal district (near the Czech border, where the uranium mines are located) news has leaked out that strong units of the East German Peoples' Police were dispatched to maintain order in the district, after announcement of new, increased work norms started a series of uprisings among the forced laborers there.

The rise in the work norms is believed to be a Moscow order which the Pankow government has transmitted to the German workers.

IN ASIA

KOREA

Tahehan Tungsten Corp. owned by the South Korean Government, resumed mining tungsten ore at two of its mines July 1. The Government had shut down the mines earlier this year when the US-South Korean tungsten agreement expired.

For the time being, the Government has instructed the mines to produce only 220 tons per month—a mere 20% of their total combined capacity. The ore will be stored in Government warehouses until the Government finds a foreign purchaser.

INDIA

Large deposits of iron ore have been discovered in the Godavari hills, 10 mi from Katmandu, according to the Nepalese Ministry of Planning. The Ministry said an American geologist has been asked to survey the area.

JAPAN

Japanese aluminum refineries hope to export 5000-6000 metric tons of primary metal this year, mostly to Brazil and Argentina, according to Kikuo Yasuda, chairman, Japan Light Metal Association.

Yasuda said the Japanese aluminum industry must continue to seek orders from overseas for virgin aluminum because production had increased while domestic consumption had declined.

Primary aluminum output in Japan in May reached a postwar record of 4659 tons while stocks at the end of May amounted to 3672 tons, compared with 2124 tons at the end of April.

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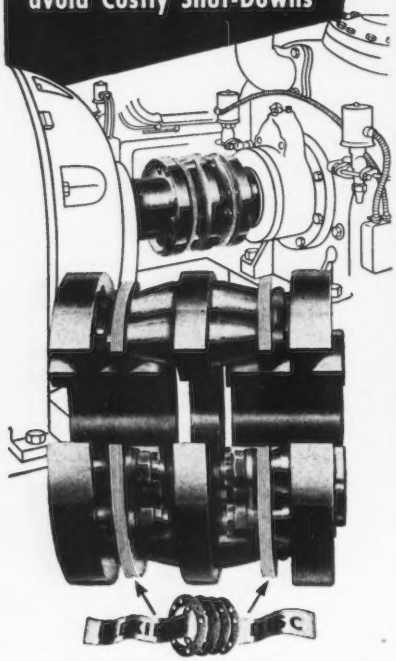

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CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
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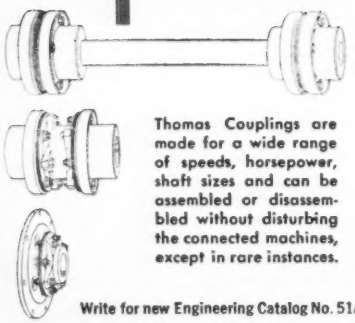

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NEW BENEFICIATION PLANT at Kaiser Steel's Eagle Mountain Mine, Desert Center, Calif., went into operation late this spring. Buildings in foreground house crushers. At left are magnetic and heavy media separation units. Shipping stockpile is in background. Plant can beneficiate 5600 tons of ore in one shift. It will upgrade ore to 56% iron or better. Plant was constructed by Kaiser Engineers Division of Henry J. Kaiser Co.

Japan *(Continued)*

Yasuda said that Ichiro Nakayama, assistant sales manager, Japan Light Metal Co., had arrived in Buenos Aires to negotiate the sale of primary aluminum to Argentina. Nakayama, who acted as representative of the Japanese aluminum industry, also would promote exports to Brazil. Japanese refineries hoped that exports to Brazil would reach 4000 tons this year.

Yasuda added that Japanese primary aluminum was sold mainly to Brazil and Argentina while Japanese aluminum rolled products were shipped mainly to East Asia.

IN THE NEAR EAST

EGYPT

From Cairo it is reported that an extensive deposit of high grade iron ore was recently discovered in Gebel el Ghoraby, about 12 mi from the Bahariya Oasis in the Western Desert. Preliminary investigation indicates that the area contains 22-million tons of high grade iron ore.

Six Egyptian and German experts, headed by Hassan Amer, iron expert on Egypt's National Production Council, have visited the area. It will be necessary to build a 125-mi road to link the deposit with the nearest seaport.

National Production Council has signed an agreement with the West German Demag Actiengeselschaft of Duisburg toward creation of the Egyptian Iron & Steel Works.

This new industry will utilize vast iron ore deposits at Asway. Ores will be smelted in a blast furnace to be erected near Helwan, just south of Cairo. The Demag firm will undertake the supply, construction and operation of the complete plant.

According to the contract, Demag is authorized to exploit the iron ore deposits in Egypt (estimated annual Aswan output is 150,000 tons), to import equipment necessary to extract the ore and to build two blast furnaces for steel production. Equipment valued at more than $20-million is to be supplied by Demag.

Plant at Helwan is to be completed in 1957 and reach full capacity of 220,000 tons in 1958. In addition to the Bessemer processes, electric furnaces also are to be installed for production of special steel.

TURKEY

An unidentified French mining firm is investigating the possibility of operating an existing bauxite mine near Akseki in Antalya Province. The mine has reserves estimated at 5-million tons.

JORDAN

United States has signed a new agreement by which it gives Jordan $8-million as a grant-in-aid, it was reported from Amman.

The muck pile tells the story of Alternate Velocity Loading

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Number of holes	11
Average depth	91′
Height of face	85′
Spacing	14′
Burden	27′
ROCKMASTER delays	1 to 6
Total explosives (Apex #2 LV and #4 HV)	11,400 lb.
Rock produced	34,170 Tons
Powder factor	3
Loading started	7:15 AM
Loading finished	10:15 AM
Blast fired	11:15 AM

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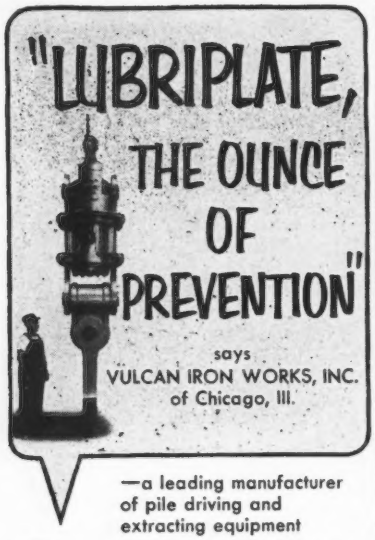

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YUGOSLAVIA's Bor Copper Mine this year is celebrating its 50th year of production. In June, the Yugoslav government earmarked some $9-million for construction of a new oven plant at Bor. Reserves at Bor in 1952 were estimated at 42-million tons of ore of 1.76% copper.

Jordan *(Continued)*

The sum reportedly has nothing to do with present Point IV aid but is a lump sum to help Jordan develop such major projects as Aqaba port facilities and phosphate and manganese mines.

SYRIA

Rich resources of chrome and manganese have been discovered in certain areas in Latakia governorate. An official technical committee in Damascus has been appointed to supervise over the production and exploitation of the two metals.

IN SCANDINAVIA

SWEDEN

Atlas-Diesel, one of the world's foremost manufacturers of rock drills and compressed air equipment, is changing its name to Atlas-Copco.

NORWAY

State-controlled aluminum plant at Ardal is seeking water-power rights from the Norwegian Parliament to permit an increase in the plant's annual production from the present 25,000 tons to 50,000 tons.

By the same power expansion, the Sunndal Works of the same company would be boosted to 40,000 tons. This plant, Sunndalsoera, already has received assistance from United States interests.

Titania Corp., ore-mining firm near Stavanger, has signed a contract with Hunting Geophysics Ltd., of England, to carry out magnetic measurements on the Titania orefields. The airborne survey is to be completed by the end of August.

Books *(Continued from p 114)*

Mineral und Erzlagerstattenkunde. By Prof. H. Huttenlocher. Two vest-pocket booklets, surprisingly packed with information on the following topics: Part I. Geochemistry of minerals, crystal-chemistry, rock formation phase laws, magmatic formations, transportation and alteration of mineral components, structural geology, mineral texture, metallogenic epochs and provinces. Part II. Iron minerals and deposits; also occurrence of gold, silver, copper, platinum, light metals, and numerous other metals and non-metallics. Published in German by Walter de Gruyter & Co., Berlin W 35, Genthiner Strasse 13. Part 1. 128 pp. Price DM 2.40. Part II. 156 pp plus glossary. Price DM 4.80.

The following publications may be obtained from the U. S. Bureau of Mines Publications Distribution Section, 4800 Forbes St., Pittsburgh, Pa.:

I.C. 7681. A Survey of the Literature on the Extractive Metallurgy and Electrolytic Refining of Bismuth. By P. M. Gruzensky and W. J. Crawford. Pp 11.

I.C. 7679. Names and Definitions of Regions, Districts, and Subdistricts in Alaska (Used by the Bureau of Mines in Statistical and Economic Studies Covering the Mineral Industry of the Territory). By Alfred L. Ransome and William H. Kerns. Pp 91 plus numerous illustrations.

I.C. 7680. Methods and Costs of Sinking a Shaft Through a Fractured, Water-

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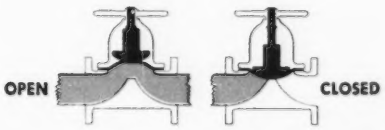

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- Screwed ends — ¼" thru 3"
- Flanged ends — lined or unlined, ½" thru 18"
- Butt weld ends — ½" thru 6"
- Socket ends — ½" thru 4"

Angle Bodies
- Screwed ends — ¼", ⅜", ½", ¾", 1¼", 2"
- Flanged ends — ¾" thru 6".

Bonnets
- Handwheel operated bonnet (available with rising stem, travel stops, extended stem, chainwheel, adapted for Tejax indicator)
- Quick turn — lever operated bonnet, ½" thru 3"
- Bendix-Westinghouse topworks
  - standard (air to close — spring to open)
    - Robotair, ¼" thru 1"
    - Rotochamber, 1" thru 4"; in tandem, 5", 6"
  - direct acting (spring to close — air to open)
    - Robotair, ¼" thru 1"
    - Rotochamber, 1" thru 4"
  - double acting (air to close — air to open)
    - Robotair, ¼" thru 1"
    - Rotochamber, 1" thru 4"
- Piston operated, 6" thru 12"
- Sliding stem bonnet, ½" thru 12"

Diaphragms
- Natural rubber, neoprene, reinforced neoprene for vacuum, hycar, butyl, white gum rubber, Kel-F, Teflon, polyethylene.

Body Materials
- Iron, bronze, stainless steel, cast steel, aluminum, monel, saran, durimet

Body Linings
- Glass, lead, soft rubber, hard rubber, neoprene, saran

Bronze Beer Valves
- Socket both ends
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Books *(Continued)*

Bearing Formation at Friedensville, Pa. By Warren Hastings, F. J. Kane, and F. D. Wright. Pp 18 plus illustrations.

I.C. 7683. Hydraulic Air Compressors. By Leroy E. Schulze. Pp 38 plus illustrations.

Nonferrous Metals Industry Unionism, 1932-1954. By Vernon H. Jensen, Professor, New York State School of Industrial and Labor Relations, Cornell University. Nearly everyone who has firsthand knowledge of labor activities in the nonferrous metals industry will agree that Prof. Jensen has picked dates which bracket a stormy era in American labor history—one which proved particularly trying to the mining industry because it had to adjust itself to the liberal labor policies of the New Deal. Behind this domestic smoke screen of adjustment between labor and management, International Communism invaded certain unions, and secured partial domination. This move reached its climax when CIO ousted the International Union of Mine Mill and Smelter Workers from its ranks for left-wing leanings in the late Forties.

These developments and many more are traced by Prof. Jensen whose reference sources include publications of both labor and management, and direct interviews with members of labor and industry, and government. The mining industry can consider itself fortunate that a competent author has taken the time to study and document one of the most vital factors affecting its pattern of existence—unionism, 1932-1954. And when the author says 1954, he means 1954 because the book covers developments as recent as Mine-Mill's victory over the CIO Steelworkers in Montana in March.

Published by the New York State School of Industrial and Labor Relations, Cornell University, Ithaca, N. Y. Pp 344. Price $4.

Geology of the Country About Coolgardie, Coolgardie Goldfields, W.A. by J. C. McMath, N. M. Gray, and H. B. Ward. A series of 26 colored geologic and structural geologic maps in the form of a supplementary atlas, Bulletin 107. Published by the Western Australia Geological Survey under authority of C. H. Simpson, Minister of Mines, Perth, Australia.

Electric Power Transmission. By Professors John Zaborzky and Joseph W. Rittenhouse, of the faculty of Missouri School of Mines and Metallurgy. A treatise on the operation of power transmission lines and systems. Would be especially useful for men responsible for operations of large mine power systems. Published by Ronald Press Co., 15 East 26th St., New York 10, N. Y. Pp 676. Price $12.50.

Residual Stresses in Metals and Metal Construction. By W. R. Osgood, Professor of Mechanics, Illinois Institute of Technology. Published by Reinhold Publishing Corp., 330 West 42nd St., New York 36, N. Y. Pp 363. Price $10.00.

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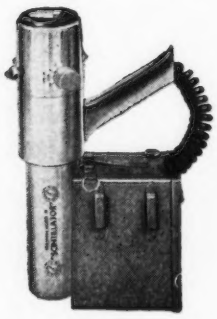

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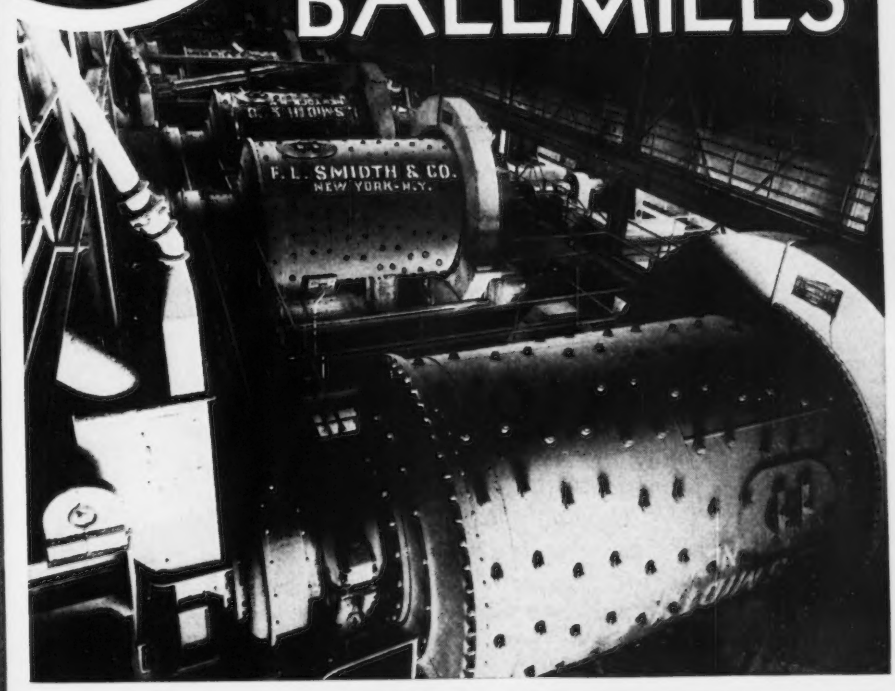

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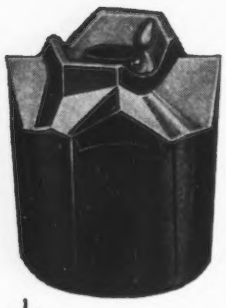
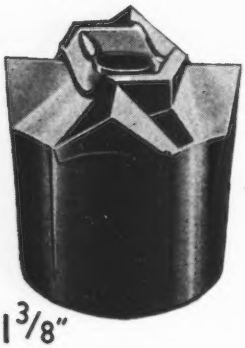


1 1/4"



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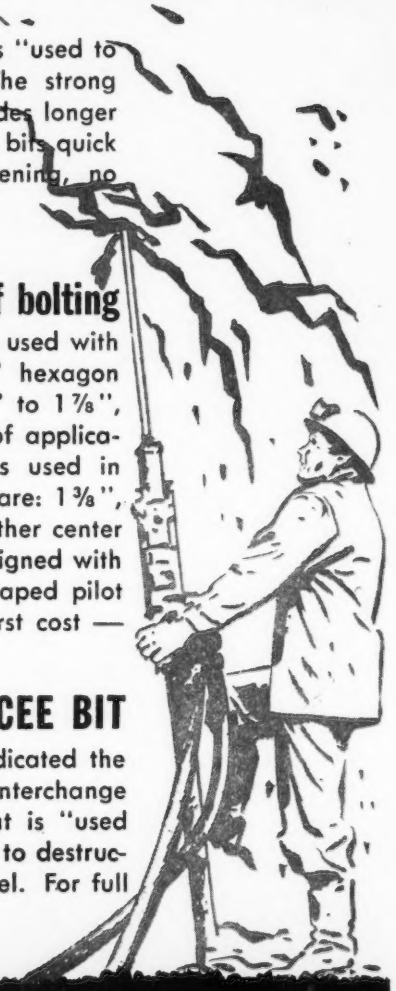

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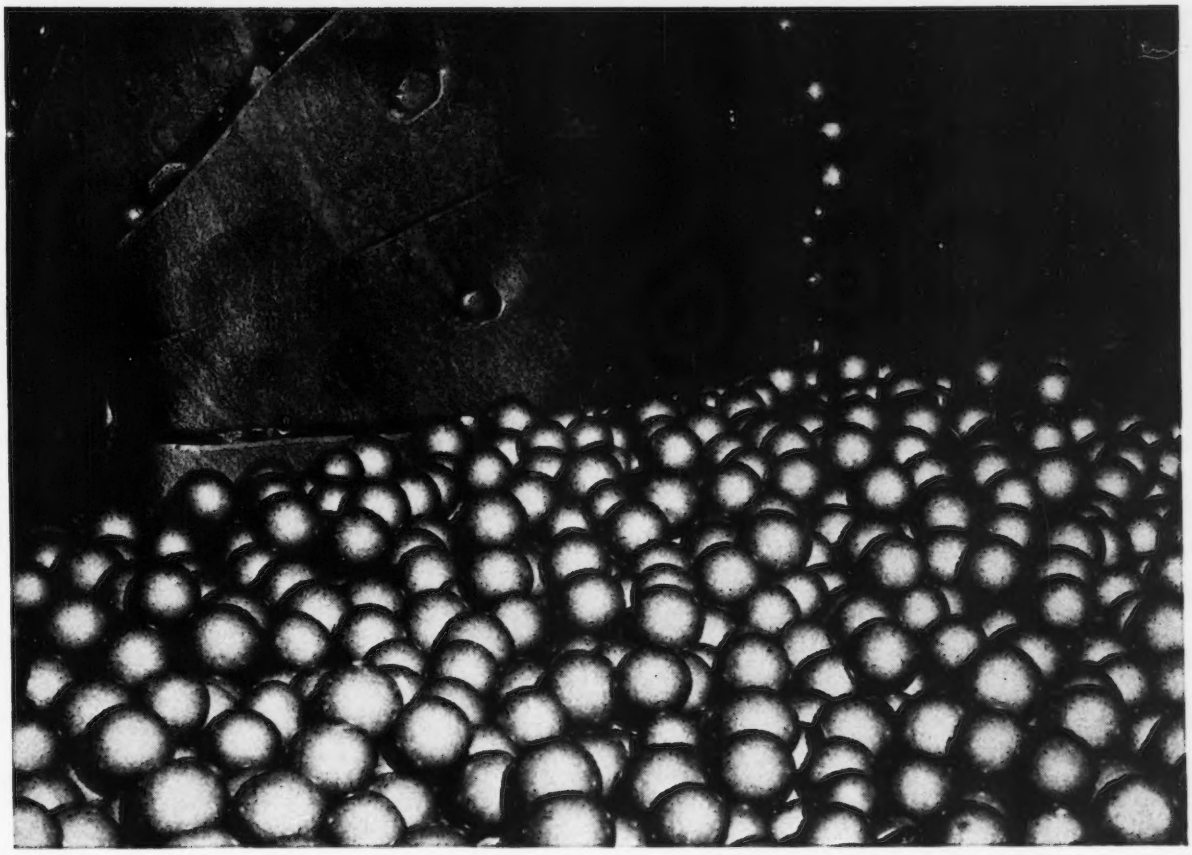

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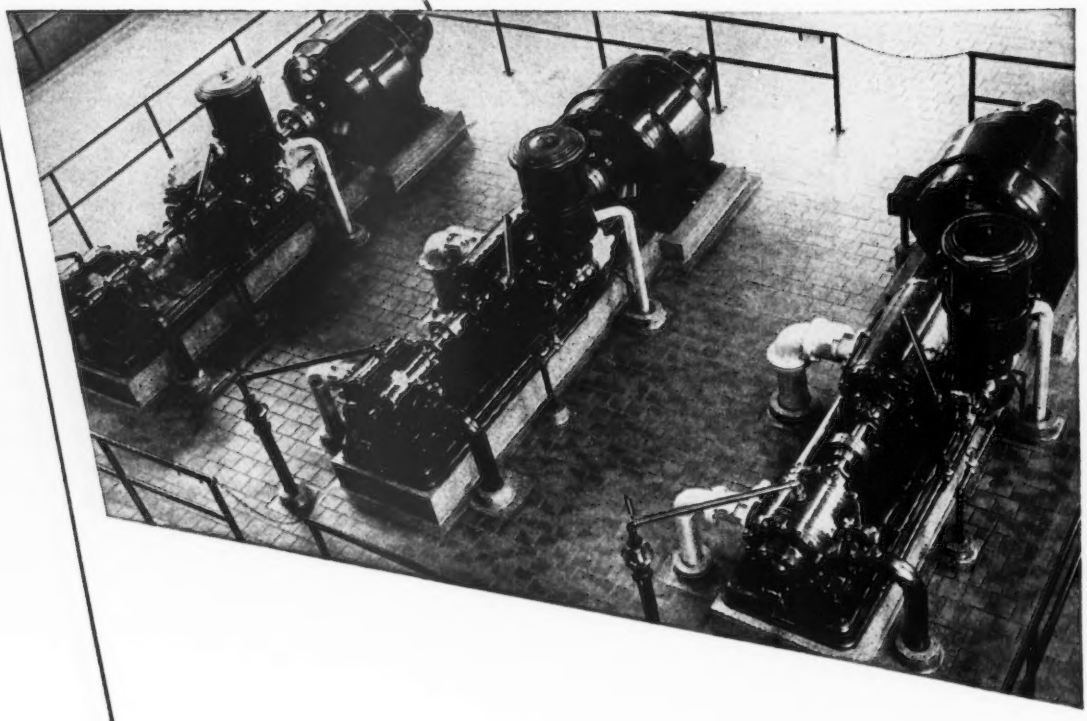

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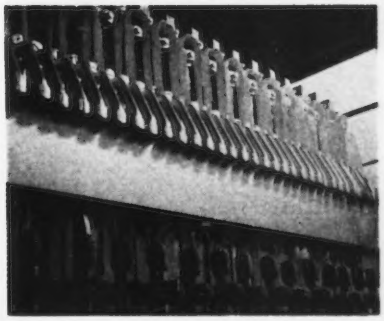

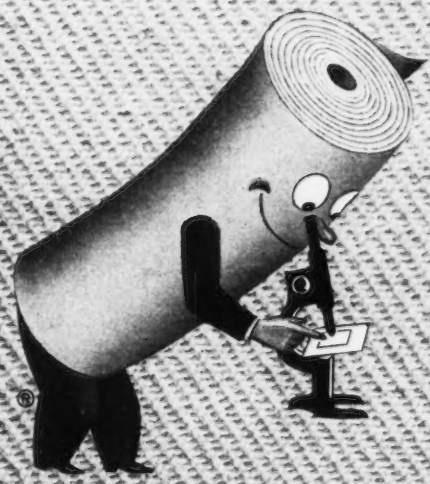

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AT YOUR FINGER TIPS, issue after issue, is one of your richest veins of job information – advertising. You might call it the "with what" type – which dovetails the "how" of the editorial pages. Easy to read, talking your language, geared specifically to the betterment of your business, this is the kind of practical data which may well help you do a job quicker, better – save your company money.

Each advertiser is obviously doing his level best to give you helpful information. By showing, through the advertising pages, how his product or service can benefit *you* and *your* company, he is taking *his* most efficient way toward a sale.

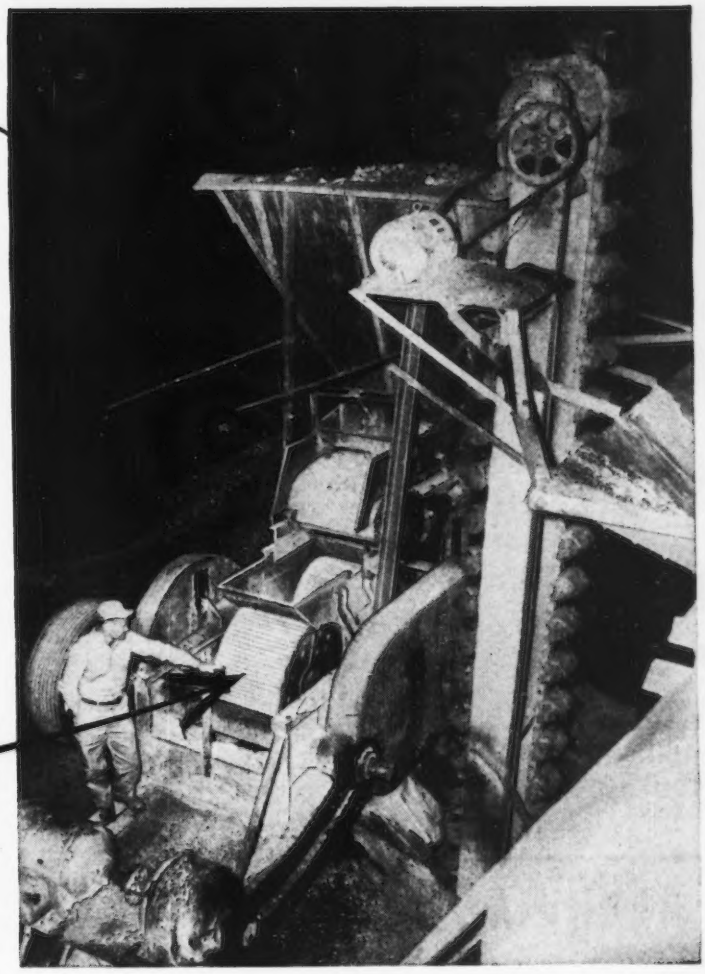
Add up all the advertisers and you've got a gold mine of current, on-the-job information. Yours for the reading are a wealth of data and facts on the very latest in products, services, tools . . . product developments, materials, processes, methods.

You, too, have a big stake in the advertising pages. Read them regularly, carefully to keep job-informed on the "with what" part of your business.

McGRAW HILL FOR BUSINESS

McGRAW-HILL PUBLICATIONS

Crushing Life Increased 500% by Hard-Facing with HAYNES 90 rod



Hard-facing the rolls in this crusher rig with HAYNES 90 Rod makes them more than 5 times more durable. Two sets of rolls are used to crush rock from 3-in. down to ½-in. screen size. They handle up to 26 thousand tons of rock with a minimum of repairs—despite severe wear from abrasion and impact. Other hard-facing materials wore out before 5,000 tons of rock were crushed.

Since HAYNES 90 Rod was adopted as the standard material on this job, production increased, down-time was reduced, labor and maintenance costs were cut, and less hard-facing material was needed per ton of rock crushed. This is typical of the kind of savings that can be realized by hard-facing with HAYNES alloys.

HAYNES hard-facing alloys give outstanding service when used to protect parts in crushers, shovels, tractors, trucks, conveyors, and other metal parts exposed to wear from abrasion, impact, corrosion, or heat.

Your local dealer carries a complete line of HAYNES hard-facing alloys, including: HAYNES iron and nickel-base rods, HAYNES STELLITE cobalt-base rods, and HAYSTELLITE tungsten carbide tube rods. Ask him for descriptive literature. If you don't know the location of your local dealer, write to Haynes Stellite Company, a Division of Union Carbide and Carbon Corporation, Kokomo, Indiana.

See... Your local Haynes Stellite Dealer

or

Write... to Haynes Stellite Company

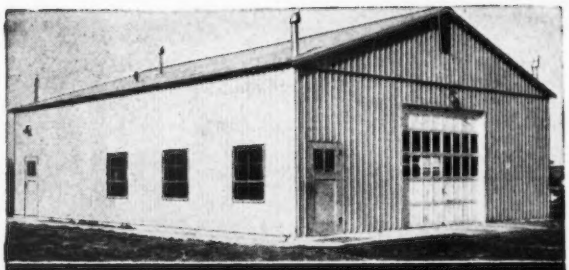
"Haynes," "Haynes Stellite," "Haystellite" are registered trade-marks of Union Carbide and Carbon Corporation.

DURIA HARD METAL

for Mining Tools
Cutting Tools
Drawing Die Industry
Wear Resistant Parts

The extraordinary fine and uniform grain structure of our Hard Metals guarantees longer tool life and high wear resistance.

DURIA-WERK KARL KEMPF
NEUSS/RH. (GERMANY)



COLUMBIAN ALL-METAL BUILDINGS

Strong • Fire-Safe • Low Upkeep

Columbian All-Metal Buildings are increasingly popular with the mining industry because of their unlimited utility value—for warehouses, engine houses, dryhouses, shops, garages, compressor houses, etc. Prefabricated from quality steel. Sectional construction assures easy, low-cost erection. Exceptionally weather-tight. Rigid, strong, fire-safe. Minimum upkeep. Order from distributors listed below—or write direct for complete information.

COLUMBIAN STEEL TANK CO.,
P. O. Box 4048-D, Kansas City, Mo.

Distributors in the United States

Denver Equipment Company
1400 Seventeenth Street
Denver, Colorado

Eimco Corporation
34 South 4th West Street
Salt Lake City, Utah

Distributors—Foreign

Avenida Ejercito Nacional 458-D Colonia Chapultepec Morales
Mexico, D.F.

ALLUVIAL DEPOSITS

Gold Tin Columbite Titanium Bauxite

Most accurately and economically tested for . . . with the

EMPIRE DRILL

NEW YORK ENGINEERING COMPANY

75 West St., N. Y. City, U.S.A. Cable Address NYECO, N.Y.

If there is

something you want . . .

that other readers of this paper can supply

or —

something you don't want . . .

that other readers can use, advertise it in the

SEARCHLIGHT SECTION
(Classified Columns)
of this paper

CORE DRILLING

"We look into the Earth"

—anywhere!

- Mineral Prospecting
- Foundation Test Borings and Grouting
- Large diameter holes for Ventilation and Escapeways

PENNSYLVANIA Drilling CO.
DRILLING CONTRACTORS & MFRS.

1205 Chartiers Ave. PITTSBURGH, PA. WAlnut 1-5816

Core Drilling *by Contract*

Exploration for coal and other mineral deposits. Foundation test boring and grout hole drilling for bridges, dams and all heavy structures.

Core Drill Contractors for more than 60 years

JOY MANUFACTURING CO.
Contract Core Drill Division
MICHIGAN CITY, INDIANA

for

★ **maximum efficiency**
★ **lowest maintenance cost**
★ **longest service life**

in

CLEANING SAND

and similar materials

Specify

McLANAHAN SCREW WASHERS

DOUBLE SCREW WASHER
with Gear Cover Removed

SINGLE SCREW WASHER

McLanahan Screw Washers—thoroughly proven in service—provide the ultimate in equipment for the efficient, low cost removal of foreign material and water from sand or coarse materials.

These washers contain many outstanding features, including: antifriction bearings which are easily removed without disassembly—extra large settling area—enclosed reduction drive—flights are cast chilled alloy iron for extreme hardness and resistance to wear.

Washers are available in Single and Double Screw models illustrated—in 20′ and 25′ lengths dependent on moisture content and capacity desired. Investigate today!

Typical installations

McLANAHAN & STONE CORPORATION
Pit, Mine and Quarry Equipment Headquarters Since 1835
Hollidaysburg, Pennsylvania

Write for Bulletin SW-953

This bulletin contains data and drawings on Single and Double Screw Washers. Write for your copy today!

"He Might Need It..."

"He never was much for letter-writing when he was in college. But he must know how anxious Mother and I are . . . now that he's off in Korea. Haven't heard from him in six weeks. Of course, they say 'no news is good news' . . . but I wonder. Maybe he can't write . . . because . . . maybe he's in a hospital somewhere. And maybe he needs blood. I don't know . . . but I'm not taking any chances. That's why *I'm* giving blood."

★ ★ ★

Yes, all kinds of people give blood —for all kinds of reasons. But whatever *your* reason, this you can be sure of: Whether your blood goes to a combat area, a local hospital, or for Civil Defense needs— this priceless, painless gift will some day save an American life!

Give Blood Now

CALL YOUR RED CROSS TODAY!

NATIONAL BLOOD PROGRAM

Business Executives!

✓Check These Questions!

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ☐ Have you given your employees time off to make blood donations?
- ☐ Has your company given any recognition to donors?
- ☐ Do you have a Blood Donor Honor Roll in your company?
- ☐ Have you arranged to have a Bloodmobile make regular visits?
- ☐ Has your management endorsed the local Blood Donor Program?
- ☐ Have you informed employees of your company's plan of cooperation?
- ☐ Was information given through Plant Bulletin or House Magazine?
- ☐ Have you conducted a Donor Pledge Campaign in your company?
- ☐ Have you set up a list of volunteers so that efficient plans can be made for scheduling donors?

Remember, as long as a *single* pint of blood may mean the difference between life and death for *any* American . . . the need for blood is *urgent!*

STRAUB

HAS RIB-CONE MILLS FOR ALL GRINDING OPERATIONS

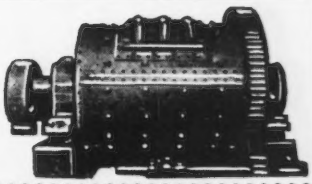
More than 100 sizes and types of ball mills. 40 years of experience in supplying every conceivable grinding requirement is at your disposal in the form of engineering counsel. *An inquiry to our engineering department will bring a prompt reply.*

STRAUB MFG. CO.

8383 BALDWIN STREET • OAKLAND 21, CALIF.

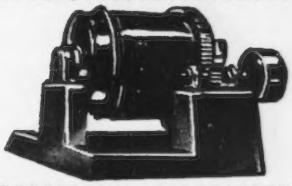
SECTIONALIZED MILL

Completely assembled in our shop, then marked and knocked down for shipping "Anywhere a Mule Can Go."



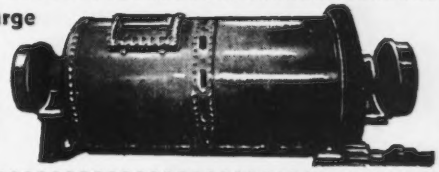
SCREENING MILL

Most economical type. Particularly suited to amalgamating and concentrating classes of ores. Capacity from 2 to 95 tons per 24 hours.



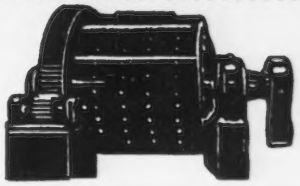
Peripheral Discharge MILL

Particularly suitable for producing a granular product. Designed for controlled grinding of tungsten and similar ores where sliming must be eliminated.



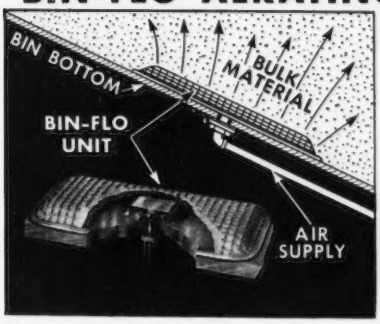
LOW PULP LINE MILL

One of the new Champion Series. Available in low pulp line, plain overflow, screening and convertible types with capacities ranging from 25 to 250 tons per 24 hours.



More than 100 Sizes and Types of RIB-CONE Ball Mills

BIN-FLO AERATING UNIT

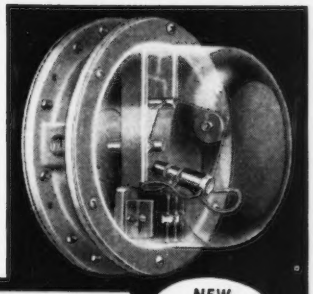


Provides Steady Flow of Dry, Finely Ground Materials which tend to bridge in storage. Uses only small amount low-pressure air.

BIN-DICATOR BIN LEVEL INDICATOR

For All Bulk Materials

signals change in level; automatically starts and stops filling and emptying equipment.



THE BIN-DICATOR CO.

13946-RI Kercheval • Detroit 15, Mich.

NEW DETAIL DATA BOOK FREE

designers and builders of equipment for basic industries

IMMEDIATE DELIVERY

VALVES

McNally Pittsburg valves are made of the finest selected materials for high resistance to the corrosive action of sludges, slimes and slurry waters.

McNally Pittsburg valves are made in a wide range of sizes for both hand and motor operation. Recommendations for the best type for your needs will be made on request.

For Basic Industries McNally Pittsburg offers:

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Engineering Design Field Erection
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Conveyors
Crushers
Dryers, Centrifugal and heat.
Washers, heavy media and jig
Kilns
Pug Mills
Screens
Pumps, Valves, Piping
Car Hauls, Dumpers

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MANUFACTURING CORPORATION

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* PLANTS *

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ORE TESTING

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MINE MANAGEMENT

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Sworn weighers, samplers & Assayers of Ores, Metals. Representatives of shippers at European ports & Works. *Market surveyors and commercial advisers assuring sales direct to consumers*
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Complete Equipment for Concrete Lining of Tunnels, Haulageways and Shafts. Special Equipment for Underground or Subaqueous Construction.
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KELLOGG KREBS
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Mineral Dressing Consultant
564 Market St. Telephone:
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RODGERS PEALE
Consulting Mining Geologist
315 Montgomery Street
San Francisco 4, Calif.

HARRY J. WOLF
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Cable: MINEWOLF
Tel.: PLaza 9-1700

PROFITABLE MINE OPERATION

calls for operating efficiency all along the line. These specialists in various phases of mine operation can aid you materially in determining quick, economical solutions to your mining problems that make for more efficient operations, resulting in lower costs and a consequent greater return on your investment. Consult them!

THE FROTH THICKENS

AND

BOOTH FLOTATION MACHINES

CONTINUE TO SHOW SUPERIORITY IN OPERATION.

VIGOROUS AGITATION
INTENSE AERATION
HIGH CONCENTRATION

INVESTIGATE
The Dividend Producing
Flotation Machine

the **BOOTH** *company*
INCORPORATED
333 West 14th South St., Salt Lake City 4, Utah

MINERALS SEPARATION • MANUFACTURE • EQUIPMENT

A tip for top performance

TeeCee
TUNGSTEN CARBIDE

&

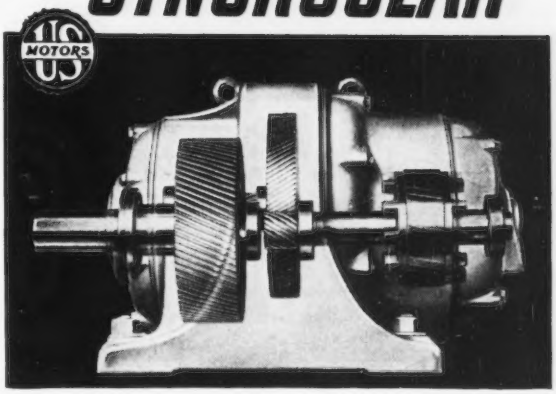
"TYPE L"
ONE PASS STEEL

LIDDICOAT

DETACHABLE
DRILL BITS

MANUFACTURED BY
Thompson Products
THOMPSON PRODUCTS LTD. • ST. CATHARINES, ONT.

Geared Power
SIMPLIFIED WITH
SYNCROGEAR



The motor that internally gears its speed

DON'T go to the expense of installing a gear box with extra coupling and guards to rig up slow speed for a motor. Install the *U.S. Syncrogear motor* and avoid extra contraptions. You'll simplify your power hook-up, save space, eliminate hazards and give your driven machine the most efficient power. The U.S. Syncrogear motor was one of the first complete integral power units, introduced 22 years ago. It's backed by experience, tested and proved performance and engineering "know-how" that only U.S. MOTORS can offer to those seeking the most dependable geared motor power.

SYNCROGEAR ADVANTAGES

Compact—rugged—quiet
No external gear box
No extra coupling
Internally-geared
Single unit on one base
Completely housed
Reduced frictional losses
Permanently-aligned parts
Super-hardened gears
Pyramidal supporting base
Solid shank pinion
Normalized castings
Extra large oil reservoir
Asbestos-protected windings
In-a-line shaft
Neat, streamline appearance
Drip-proof surface

U.S. SYNCROGEAR MOTOR 4 TO 10,000 RPM. 1/4 TO 30 H.P.

REQUEST FOR SYNCROGEAR MOTOR BOOKLET

U. S. ELECTRICAL MOTORS INC. EMJ-8
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or Milford, Conn.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE___ STATE____

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: BUSINESS: **"OPPORTUNITIES"** :EQUIPMENT :USED OR RESALE

UNDISPLAYED —RATES— DISPLAYED
$1.20 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.
Position Wanted undisplayed rate is one-half of above rate, payable in advance.
Box Numbers in care of our New York, Chicago & San Francisco offices count as one additional line.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.
Equipment Wanted or For Sale Advertisements acceptable only in Displayed Style.
Individual Spaces with border rules for prominent display of advertisements.
The advertising rate is $12.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
An advertising inch is measured 7/8" vertically on one column. 3 columns—30 inches—to a page.

Send New Ads to N.Y. Office, 330 W. 42nd St., N.Y. 36, N.Y., for September issue closing August 20th

RHOKANA CORPORATION LIMITED
METALLURGICAL SUPERINTENDENT

Applications are invited from experienced Graduate Metallurgical Engineers for the position of

Metallurgical Superintendent

to Rhokana Corporation Limited, Kitwe, Northern Rhodesia

The position necessitates an extensive knowledge of copper metallurgy, and administrative experience in a senior executive capacity is essential. Preference will be given to applicants between the ages of 40 and 50 years.

Responsibilities include the supervision and direction, through Plant Superintendents, of complex metallurgical operations involving the concentration, reverberatory smelting and electrolytic refining of copper on a large scale, as well as ancillary operations such as the production of sulphuric acid from converter gases.

In addition, the Metallurgical Superintendent is responsible for the direction of a large cobalt plant, producing electrolytic cobalt from concentrate.

Initially, the engagement will be for a period of three years, but service may be extended indefinitely by mutual agreement.

The salary to be offered will be commensurate with the successful candidate's qualifications and experience. In addition, a Cost of Living Allowance is paid, and a Cash Bonus, based on the difference between the production cost and selling price of copper, at present amounting to over 60% of basic salary, accrues. Membership of the Corporation's Pension Fund is obligatory.

The Corporation will bear the cost of first-class transportation for the successful candidate and his family, including children up to the age of 18 years, to Kitwe, Northern Rhodesia. In addition, an allowance will be made to cover the reasonable cost of transporting personal effects of the appointee, other than heavy furniture. On expiration of the contract, repatriation expenses will again be borne by the Corporation.

A house, complete with heavy furniture and certain furnishings, will be available immediately, free of charge.

Excellent medical facilities are provided, and recreational facilities are outstanding. The climate is temperate and healthy.

Applications, stating age, marital status, educational and professional qualifications, details of past experience and positions held should be addressed to:—

The General Manager
RHOKANA CORPORATION LTD.
P. O. Box 137, Kitwe, Northern Rhodesia

Candidates are expected to be physically active and a medical certificate of health must accompany applications.

RESEARCH AND DEVELOPMENT METALLURGISTS

New career positions in leading independent research organization for graduate metallurgists with interests and appropriate experience in extractive metallurgy or other minerals processing phases. Merit promotions and excellent opportunities for professional achievement. Please reply immediately for prompt, confidential consideration to

BATTELLE MEMORIAL INSTITUTE
505 King Avenue
Columbus 1, Ohio

WANTED

Assistant Superintendent in a combined Mechanical and Electrical Department of a long established underground mining operation in East Tennessee.

Successful applicant should have had several years experience in maintenance, and preferably, but not necessarily, be a technical graduate in Electrical Engineering.

Climate and living conditions are excellent Give details of work experience, and include at least three references as to character and ability. Salary open.

P 3270 Engineering & Mining Journal
330 W. 42 St. New York 36, N. Y.

Opportunity for Young Engineer

Old established metal mining company in Northern California needs young mining or civil engineer. Family dwellings, good schools including nearby high school and junior college. Excellent climate, 2,600 ft. elevation. Write giving details of experience, age, salary expected:

P-3193 Engineering and Mining Journal
68 Post Street, San Francisco, Calif.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

MECHANICAL ENGINEER or Equivalent, 25 to 35, with some experience in general mine construction and maintenance, for a position in the mechanical department of a base metal mine in Mexico. Knowledge of Spanish desirable. Starting salary $4,200 U.S. Cy. yearly. P-2994, Engineering & Mining Journal.

GENERAL MINING Superintendent for large mining company in Mexico. Should have varied experience in underground mining methods including broad engineering. Spanish-American experience desirable although not essential. Pleasant healthy location on railroad and highway. Application stating age, experience, references, married or single, salary required, should be airmailed to Mining Company, Apartado No. 6951, Mexico City, Mexico.

MINING ENGINEER, 25 to 35, with some underground mining experience for varied duties at a base metal mine in Mexico. Knowledge of Spanish desirable. Starting salary $4,200 U.S. Cy. yearly. P-2993, Engineering & Mining Journal.

MECHANICAL ENGINEER with two or more years experience in the design and development of belt conveyors to bulk material handling applications. Related experience in steel structures design, drive pulley systems, crushers and feed hoppers desirable. Salary open dependent upon applicant. Location Eastern Ohio, good future with leading mining equipment manufacturers. Send resume, photo if available and salary requirements to P-3469, Engineering & Mining Journal.

(Continued on opposite page)

MINING EDITOR WANTED

An opportunity for interesting, varied, stimulating, and useful employment is open to you on the editorial staff of *Engineering And Mining Journal*, if you possess these qualifications:

1. A degree in mining engineering from an accredited college or university.

2. Three to five years' experience in the mining field, preferably in open pit mining, but underground mining will do.

3. About 30 years old, preferably under 35, willing to live in the New York area.

4. Ease in writing reports or articles, and the ability to express an idea clearly by drawings, photographs, or charts as well as by writing.

5. An alert mind that grasps new ideas quickly and occasionally gets a new idea on its own.

If you feel you have these qualifications, and if you'd like to consider editorial work in the metal and non-metallic mining field, please write, enclosing a resume of your experience and education, a sample of anything you have written, a recent photograph (if available), and an estimate of your salary requirements.

R. H. Ramsey, Editor
ENGINEERING and MINING JOURNAL
330 West 42 St., New York 36, N. Y.

CHIEF ENGINEER

A mature engineer with administrative ability and a broad practical background of experience in construction, plant design, mechanics and cost estimation, to assume charge of Engineering Department. Experience in flotation and non-metallic minerals beneficiation is desirable. The scope of the work covers producing mines and plants in the western and southern states.

Please address replies to:
PERSONNEL MANAGER
BAROID SALES DIVISION
NATIONAL LEAD COMPANY
P.O. BOX 1675 HOUSTON, TEXAS

ORE DRESSING-MINERALOGIST

Engineer for research and development in Ore Processing, primarily nonmetallics. Experience in mineral identification desired. Salary commensurate with experience. Location — Florida.

P-3497 Engineering and Mining Journal
330 W. 42nd St., N.Y. 36, N.Y.

POSITIONS WANTED

MINING ENGINEER, 35, B.S., Mine E. Registered Professional Engineer. Married. Fifteen years experience in all phases of open pit mining operations, engineering, exploration, equipment maintenance, cost control, etc. Desires responsible position, location U.S.A. Now employed. Available reasonable notice. PW-2844, Engineering & Mining Journal.

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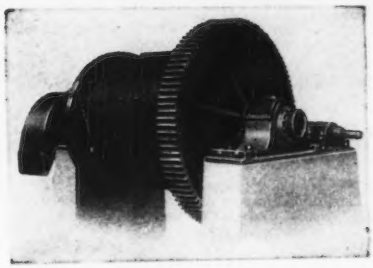

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Yuba Manufacturing Co. 198

Just 20 Seconds-

CAN MEAN YOUR PROFIT!

Twenty seconds on every trip made—that's what an Athey PD20 Side-dump Trailer can save you—and that twenty seconds can mean the difference between profit and loss on a closely-bid contract.

PD20s can take on a 25 cu. yd. load, haul at speeds up to 34.2 MPH, cast their entire load, to the side, over steep fills or banks *without stopping!* This non-stop dumping cycle is where you save your twenty seconds—and if you don't think a twenty-second saving is worthwhile, figure it out for yourself in the space at left. You'll see how twenty seconds can mean your profit.

Ask your Athey-Caterpillar Dealer to show you how the Athey side-dump principal gives you non-stop production and profits. Just give him a call or write direct.

FIGURE IT YOURSELF . . .

Multiply 20 (seconds a PD20 can save on each cycle) X_____ (number of hauling units on your job) X_____ (number of round trips each unit makes per hour) X_____ (number of hours you work each day) X_____ (number of work days estimated in your contract). Divide your answer by 3600 and you see how many *hours* Athey PD20s could save on *your* job!

Athey

PRODUCTS CORPORATION

5631 West 65th Street Chicago 38, Illinois

An Athey PD20 Side-dump Trailer dumps a 25 cu. yd. load of mixed material over a spoil bank. The dirt is cast away from the wheels as the rig keeps on the move. Patented hydraulically-controlled stabilizing system assures stability, even on dump!

ONE NO. 80 SCRAPER DOES IT ALL!

The Caterpillar No. 80 Scraper in the picture removed nearly all the clay overburden from this 100-foot-deep pit. It was then used to move iron ore to the washing plant of Hodge Mining Company at this operation 7 miles north of Canton, Ga. Cycle time was 8½ to 9 minutes over a haul distance of 2000 feet, involving extremely stiff grades out of the pit.

Maneuverability in these cramped quarters is a "must." With its ball-and-socket front axle, and sharp turning ability, the No. 80 Scraper is just the rig for this job, according to John W. Hodge, owner.

Even in mucky clay, the No. 80 loads fast, with a live, "boiling" action. The load is cradled low for stability in rough going, and big tires give excellent flotation. Absence of overhead structure permits good operator vision, and presents an easy "target" for shovel loading. The No. 80's capacity is 20 heaped yards (23 with top extensions). It unloads fast and even, thanks to the positive ejection system that controls the rate of spread and sweeps the bowl clean of even sticky materials.

The versatile No. 80 Scraper, teamed with the Caterpillar D8 Tractor, may be the rig to cut costs in *your* mining operation. Or one of the other CAT* Scrapers for track-type and rubber-tire tractors with capacities from 4.5 to 25.5 yards. Your Caterpillar Dealer will help you select the scraper that's most profitable for *you*. And he'll stand back of his products with prompt, dependable service and genuine Caterpillar replacement parts. Ask him for a demonstration right on your own job today.

Caterpillar Tractor Co., Peoria, Ill., U. S. A.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

**NAME THE DATE...
YOUR DEALER
WILL DEMONSTRATE**

day after day

SLAG ...by the carload!

P&H "THE PRIDE OF THE PIT"

Birmingham Slag Co. has just put another P&H 1600 Electric Shovel into operation!

Why does Birmingham Slag go P&H?

The reasons are clear: P&H is the one machine that can consistently dig in steamy, corrosive atmospheres . . . atmospheres like those created when water cools hot slag. P&H Magnetorque* eliminates all DC commutators in the hoist motion — the corrosion trouble spot of ordinary machines. P&H electrical system is simpler, too — designed for shovel service . . . not adapted for it!

Bail pull is another Birmingham Slag consideration. For to reclaim old slag dumps left to "air cooling" requires a machine with stamina . . . a machine capable of digging in concrete hardness and keeping it up all day long. Here, again, P&H fills the bill! For with exclusive Magnetorque on the hoist drive, P&H Electric Shovels have the industry's highest bail pull . . . more power at the digging end — *where it's needed!*

These are the kinds of advanced features you get from P&H. Full facts are in Bulletin X-139. Send for your copy today.

*T.M. of Harnischfeger Corporation for electro-magnetic type coupling.

P&H LARGE EXCAVATOR DIVISION

HARNISCHFEGER
CORPORATION
MILWAUKEE 46, WISCONSIN

the P&H Line

Joy conveyor belt on TIMKEN® bearings exceeds rated capacity by 1000 tons per hour!

ALTHOUGH the 48-inch Joy conveyor belt at the Peabody No. 10 mine at Pawnee, Illinois, has a rated capacity of 1000 tons an hour, peak tonnages have hit over 2000 tons per hour! This belt is part of an all-conveyor-belt system with a total length of 1729 feet. Throughout this entire system Timken® tapered roller bearings are used on the troughing and return idlers!

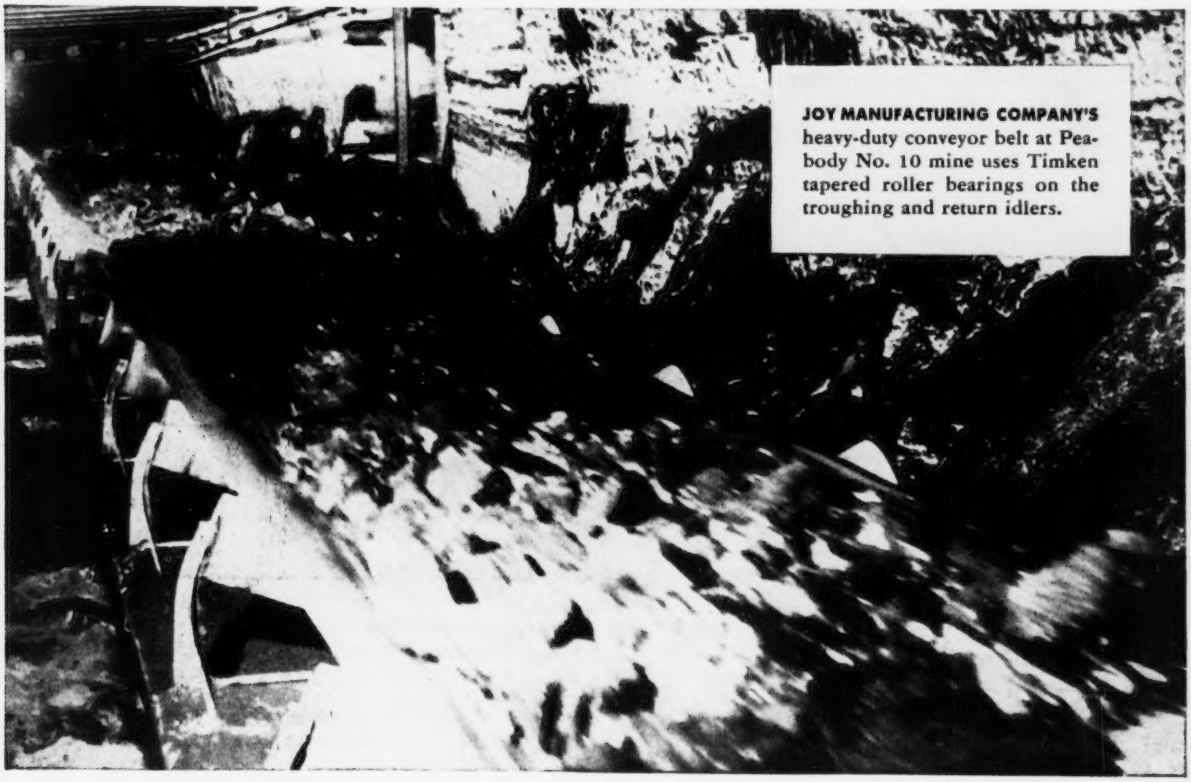
Timken bearings are the only tapered roller bearings proved by 15 years or more of service in heavy-duty conveyor installations using the popular dead shaft construction. Due to line contact between roller and races, they have high load capacity. And by using Timken bearing sizes that are mass produced for the automotive industry, you get extra capacity bearings that actually cost you *less* than the smaller sizes you'd normally use.

You get longer roller and belt life with Timken bearings. Their true rolling motion and extremely smooth surface finish mean less friction—less sliding and scuffing between idlers and belt.

With Timken bearings, you get longer life, minimum maintenance. Remember "Timken" is not a bearing type. It is a trade-mark applying to bearings made by The Timken Roller Bearing Company. Insist on Timken bearings in the conveyors you build or buy. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best.

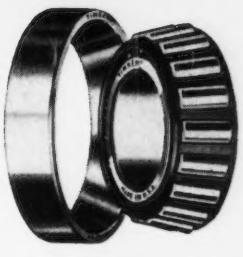


JOY MANUFACTURING COMPANY'S heavy-duty conveyor belt at Peabody No. 10 mine uses Timken tapered roller bearings on the troughing and return idlers.

VISIT OUR EXHIBIT AT THE MINING SHOW

CIVIC AUDITORIUM
SAN FRANCISCO, CALIFORNIA
Booth 822
SEPTEMBER 20th THROUGH 23rd

TIMKEN
TRADE-MARK REG. U.S. PAT. OFF.
TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ◫ LOADS OR ANY COMBINATION ✳